THE HISTORY OF *Many Memorable Things*

In Uſe among the ANCIENTS, but now loſt.

AND AN

ACCOUNT OF *Many Excellent* DISCOVERIES

Made by and now in Uſe among the
MODERNS, both *Natural* and *Artificial.*

Tranſlated from the Original of

GUIDO PANCIROLLUS,

Illuſtrated with Curious Remarks, Pleaſant
Relations, and uſeful Diſcourſes.

To which is added,
The Hiſtory of PRINTING, ſhewing the Time of its Beginning,
and of Books printed before the Year 1500.

TOGETHER
With the Hiſtory of what the MODERNS have found
which the ANCIENTS never knew.

Taken from the Writings of Biſhop Sprat, *Mr.* Boyle, *and the*
Royal Societies of London *and* Paris.

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THE CONTENTS OF THE Second Book.

CONTAINING Some Modern Inventions unknown to the Ancients.

Chap.		Page
I.	*OF the new World*	265
II.	*Of Porcellane*	285
III.	*Of the Bezoar Stone*	284
IV.	*Of Rhubarb and Caſſia*	291

Chap. V.

THE Second BOOK OF *PANCIROLLUS.*

Concerning ſeveral Modern Inventions which were unknown to the Ancients.

CHAP. I.

Of the New World.

AMONG thoſe Things which were unknown to Antiquity, I ſuppoſe the (a) *New World*, found out by *Chriſtopher Columbus*, a *Genoeſe*, in the Year 1492, to be one of the chiefeſt, and to be moſt worthy our Notice and Obſervation. (b) There was no Knowledge of it in former Times, ſave only that the *Fortunate Iſlands* were ſaid to be there, the Belief whereof might poſſibly be inſtill'd by Navigators. And indeed that is a wonderful Thing, and the moſt ſtupendous of all thoſe we are capable of knowing, and I have been oftentimes ſtruck with Admiration of it.

After the Diſcovery of this World, we (b) came to the Knowledge of ſeveral kinds of Animals and Plants, and of various Curioſities or Pieces of Art, of which hitherto we were utterly ignorant; as *Cocks*, and *Indian Mice*, (d) *Guaiacum*, or holy Wood, (e) *China*, (f) *Sarſaparilla*, (g) *Saſſafras*, and other wholſome and medicinal Herbs, the uſe whereof hath been very neceſſary ſince the *French* Diſeaſe (call'd by ſome the *Neapolitan*, becauſe brought to *Naples* by the *Spaniards* returning from the Iſle of *Peru*) (h) was known in theſe Countries.

From thence came alſo (h) *Indian* Figs, (k) Nuts and Canes, and a *vermicular* kind of Web made of Silk, together with certain (l) Pictures compos'd of Birds Feathers, ſo neatly expreſs'd, that even *Painters* themſelves cannot repreſent them more lively in their Colours. There were brought alſo from thence *Attalick* Textures, which variouſly expos'd to the Air or Light, ſhew'd either a golden, or roſy, or ſilken, or any other Colour. From the ſame Region came alſo (m) *Knives* made of Stone, which would cut any thing, and *Slippers* made of *Indian* (n) Ruſhes, and ſeveral other Things, which to reckon up here, would ſeem long and tedious.

The COMMENTARY.

(a) [*The New World.*

So call'd not in reſpect of its *Creation*, but in re-

reſpect of its *Diſcovery*, which was made but in latter Years, leſt with *Democritus* and *Epicurus*, with *Anaxagoras* and others, we ſeem to affirm a Plurality of Worlds, which fond Opinion having no Reaſon to ſupport it, is quite fallen to the Ground, and is utterly exploded.

This Expreſſion of (*New-World*) was anciently in uſe, it frequently occurring in Claſſick Authors; for *Ovid* writing to *Livia*, honours *Germany* with the Title of a *New World*, as *Hegeſippus* doth *England*. Beſides, *Great Britain* was look'd upon by the *Romans* to be another World beyond *Calais*; hence *Virgil*'s *Melibœus* in the firſt Eclogue, clears up his Voice, and ſings thus. *Et Penitus toto diviſos orbe Britannos.*

" A Race of Men from all the World disjoin'd.

And *Horace* calls them *ultimos Orbes.*

---- *Serves iterum Cæſarem in ultimos*
Orbes Britannos ---- i. e.
" Preſerve thou *Cæſar* ſafe we thee implore,
" Bounds to the World's remoteſt *Britain* Shore.

And *Lucan* mentions an *unknown* World in his fifth Book, where he ſpeaks of the *Arabians* flocking in to the Aſſiſtance of *Pompey*.

(*b*) [*No Knowledge of it in former Times.*]

I ſhall not launch out into that great *Diſpute*, whether the New World was known to the Ancients or not, nor make an Enquiry whether it was diſcover'd to 'em under any other Name; but rather than tranſcribe the Arguments *pro* and *con*, ſhall refer the Reader to Dr. *Heylin*'s Coſmography, and to other Authors that treat of that Subject.

(*c*) [*We came to the Knowledge of ſeveral Things.*]

Which indeed are ſo many, that it would be an infinite piece of Buſineſs to comment upon them, and would be a Work too voluminous for theſe few Pages. And therefore touching the Nature and Situation, the Habit and Manners, the Animals and Fruits, and other Things relating to the *New World*, I crave leave to ſend the Curious to thoſe ſeveral Treatiſes that have been written of the *Weſt-Indies*.

(*d*) [*Guaiacum.*]

This is an *Indian* Name, but is now known throughout the World, whereby is ſignify'd the Wood *Guaiacum*, ſometimes call'd *Indian*, and ſometimes call'd *Holy Wood*. It is not only found in the Iſle of S. *Dominic* (from whence it was firſt brought to us) but in the Iſles of S. *John*, and the *Holy Croſs*. The Iſland of S. *John* ſtands better than that of *San Domingo*; that in the former Place *moiſtens* the Bodies of them that uſe it, but this in the latter *dries* them more, becauſe it partakes of a greater Heat and Influence of the Sun.

The *Guaiacan Tree* is about twelve Cubits high, and about the Thickneſs of an ordinary Man; it bears *Leaves* like Plantanes, hard and nervous, but ſomewhat leſſer, rounder and ſtronger. Its *Flower* is yellow, and its *Fruit* about the bigneſs of a Walnut, and not unlike Cheſnuts or Olives. 'Tis of a triangular Figure, and hath a white Kernel, and the pleaſant taſte either of Cheſnuts or Pine-Apples; ſo that it kindly invites you to the delicious *Banquet* of its ſweet ſelf. The Rind of *old Trees* is black and ſwarthy, but of young *Saplings*, ruddy and ſanguine, but is ſomewhat inclining to be dark and cloudy;

under which is to be ſeen a pale kind of Wood, but more inwardly obſcure, and of that Hardneſs, that it defies the Edge of the keeneſt Ax. 'Tis very heavy and *reſinous*, and hath a fatty kind of Smell, a ſweet Taſte, though a little bitteriſh, but ſomewhat ſharp and acid in a Potion.

Though ſome think *Sanctum Lignum* and *Guaiacum* to be two diſtinct Things, yet others affirm them to be one and the ſame, though they differ in Colour, Bigneſs and Weight; for what though the former is *white* both within and without, and the latter *black*? The Reaſon of that is this, becauſe *Lignum Sanctum* is more ſtricken in Years than is your *Guaiacum*; for this, the older it is, the *blacker* it is, and ſo conſequently 'tis ſo much the *whiter*, by how much the *younger*.

The uſe of this Wood came to be known to us after this manner. A certain *Spaniard* having received an unlucky Blow with a *French Faggot-ſtick*, given him by an *Indian* Doxy, and being ſorely tortur'd with the Anguiſh of the Stroke, his *American* Servant gave him a Doſe of the Water of *Guaiacum*, which cur'd his Diſeaſe at a *Clap*, and made the *Wight* capable of cutting a Caper; ſo that ſeveral other *Dons* ſeeing the effect of the Medicine, made uſe of it afterward with the like Succeſs in the ſame Diſtemper. This Cure being blazon'd in *Sevil* by all thoſe that came from the Indies, was immediately ſpread throughout all *Spain*, and the Fame thereof was preſently on the Wing, and flew in a trice over the whole World.

(*e*) [*China.*]

The Root of this is by way of Excellency call'd *China*, from that vaſt Country where it grows, by ſome ſtyl'd *Chinna*, by others *Cina*, by the Natives *Lampatan*. 'Twas firſt known to the *Indians* in the Year 1535, for then the French Diſeaſe was cur'd with *Guaiacum*, which when it was firſt brought out of the *Spaniſh Indies*, was worth its weight in Gold; but upon the Diſcovery of the Virtue of this Root, it ſunk very much in its Value, eſpecially in the *Eaſt-Indies*, where it was laid almoſt wholly aſide, and as an *Alien* made to give place to the other which was a *Native*.

This Plant is but a *Pigmy* or a Dwarf in Stature, being not above three or four Spans in height, but hath ſlender Stalks, and thoſe well clad with Leaves. It climbs up Trees like creeping *Ivy*, and hath an excellent *knack* (like that Vegetable) of *hugging* cloſely, and therefore 'tis fit and convenient that it be bleſs'd with the *Neighbourhood* of other Trees.

It hath a Root about a Span long, and that ſometimes *thick*, and ſometimes *ſlender*, which being pull'd *freſh* out of the Earth, is ſo ſoft and tender, that it may be eaten either raw or boil'd. The *Chineſe* eat it, when tender, with ſtew'd or boil'd Meat, as we do Turnips. Merchants and Mariners tell us they grow in *Fens* and *Mountains*, and oftentimes in Woods, out of which they are frequently dug.

That is the beſt which is ponderous and freſh, firm and ſolid, neither rotten nor Worm-eaten, nor falls into Powder when cut and ſlic'd, and which is ruddy without, and white within. This *Root* ſeldom comes out of *China* to us whole and entire, but always putrify'd and corrupted (for ſcarce one in four is good for any thing, the

Knavery of Merchants to conceal its Rottenneſs, putting *Bole-Almonack* into it) and the Reaſon of it is not ſo much the Diſtance of the Place, as the *Heat* of the Climate, whither Merchants and Mariners do not only *ſail*, but oftentimes *ſtay*, either to victual their Ships, or to avoid a Storm, and ſo are forc'd to endure thoſe exceſſive Heats between the *Tropicks*, where the Moiſture of the Root muſt needs be dry'd up.

This Root being incident to two *Faults*, either to be ſpongy or light, or to be corrupted or *Worm-eaten*; the latter are to be choſen before the former, provided they are *ponderous* and *weighty*; for a Decoction of the *light ones* will ſoon putrify, neither have they any Virtue to be medicinal to the ſick.

(*f*) [*Sarſaparilla.*]

When the Phyſicians mention this, they underſtand its *Root*, which is the only thing that comes to us; 'tis a Plant that hath many Roots about two Cubits long, and in Colour like Aſhes; it grows ſometimes ſo deep in the Earth, that to pull it out entire, they muſt dig very low; its Branches are knotty and woody, and are quickly dry'd. Whether it bears a Fruit or a Flower is not yet well known.

The *Spaniard* was the firſt that gave it this Name, who *chriſten'd* it as ſoon as ever he ſaw it, in regard of its likeneſs to *Smilax Aſpera*, which is a *ſpinous* kind of Plant, bearing Leaves like *Ivy*, and which they call in their Language, *Sarza-parilla*, i. e. a Thorny Vine, *Sarza* ſignifying the former, and *Parilla* the latter.

An eminent Phyſician, and a skilful Herbaliſt tells us, that he ſaw in the Duke of *Florence* his Gallery, a whole entire Plant of *Sarſaparilla*, brought out of *Spain*, which did not in the leaſt differ from *Aſpera Smilax*, and he found it afterward by Experience to be true; for having pull'd off the Roots of *Aſpera Smilax*, with a Decoction of the ſame, he cur'd many that were infected with the French Diſeaſe. The ſame is confirm'd by *Gabr. Fallopius*, the Glory and Ornament of *Italian* Phyſicians; who tells us, that he knew by Experience the Root of *Sarſaparilla* to be the ſame with that of *Aſpera Smilax*, becauſe it hath the ſame Matter or Subſtance, Marks and Virtues: For (ſaith he) I have frequently us'd it in the Cure of the French P--, inſtead of *Sarſaparilla*.

This Root was brought firſt from *New-Spain*, but *Peru* produceth much better. They begin now to bring it from the Province of *Cuito*, it growing in abundance near the City *Guajaquil*, hard by a great River of that Name, which ſprings from the *Peruvian* Mountains. The Water of this River is very wholſome and *medicinal*, curing many Diſeaſes, and the *Spaniards* and *Indians* come above ſix hundred Miles to it; who waſhing themſelves in it, and drinking great Quantities of it, do *ſweat* very much every Morning, and ſo by that Means are freed from their Diſtempers. Some think that *Sarſaparilla* derives its Virtue from that River.

This Root commonly ſhoots forth (like Hellebore) into many *Fibres*, diſpers'd very wide and deep in the Earth, even more than ſix Cubits, and being folded and wrapt up together, they grow into Bundles of three or four Pound weight. Some of the *Strings* or Threads about theſe Roots are thin and ſlender, and others are more thick and bulky. Theſe Roots have a white, nervous, hard kind of Fibre running through their *Centre*, which is call'd their *Soul*; the Rind is ſolid, like compacted Fleſh that involves the Marrow, it hath neither Smell nor Taſte.

That *Sarſaparilla* is to be choſen as the *beſt*, which is white, thick and clammy, hard to be broken but when it falls into Fitters; for the red and wither'd, the putrify'd and rotten, and that which crumbles into Powder, is very *uſeleſs*. That is naught alſo which hath a dirty, *luteous* kind of Colour within, wherein you may ſee very legibly the Marks and Footſteps of Worm-eating and Corruption.

(g) [*Saſſafras.*]

'Tis call'd by the *Indians Pavame*, by the *French* (whom the *Spaniards* imitate) *Saſſafras*. 'Tis like a middle-ſiz'd *Pine* both in Form and Bigneſs, having a naked Trunk, whoſe Branches ſpread towards the Top like a prun'd *Pine-Tree*; it hath a dusky kind of *Bark*, cas'd over with a thin Aſh-colour'd Film, and hath a tart *acrimonious* Taſte, but very *aromatical*, not much unlike that of Fennel; ſo that a ſmall quantity of its odoriferous Breath, will eaſily perfume a whole Room.

Its *Trunk* and Branches are of a white Subſtance, ſomewhat inclining to an Aſh-colour, but not of ſo *aromatical* a Taſte as the Rind. Its Leaf is triangular, not unlike that of a *Fig*, but its freſh ones reſemble thoſe of a *Pear-Tree*, but are always green, *i. e.* there is always a Succeſſion of new Leaves, though of a more *cloudy* Verdure, and fragrant, if dry. 'Tis uncertain whether it bears a *Fruit* or a *Flower*; it hath ſometimes thick, and ſometimes thin and ſlender Roots, according to the Size and Bigneſs of the Tree. There is an Aſh-colour'd kind that ſticks cloſe to the Root, and is more *aromatical* than the Bark of the Tree, ſo that a *Decoction* of the Root is ſweeter, and more excellent, and is in very great uſe among the *Spaniards.*

Saſſafras grows in *Florida*, a certain Province of the New-found World; and there, in maritime and temperate Places, neither too hot nor too dry, nor too moiſt, as in the Port of S. *Hellen* and S. *Matthew.* 'Tis not eaſily found any where elſe throughout the whole Country, but in this Province there are whole *Woods* of it, which by reaſon of their Fragrancy, the *Indians* at firſt arriving, took them for *Caſſia* and *Cinnamon*, and not without good Reaſon, ſince the Rind of this Tree is as ſweet as the latter, and a Decoction of it, hath the ſame Effects as one made of that ſpicy Tree.

The *beſt* to be choſen, is, firſt the Root, and then the Branches, and then the Trunk, but yet the *Bark* excels them all. The *Indians* apply freſh and green Leaves, well beaten and bruiſed, to Sores and Wounds, but reſerve the dry ones for other medicinal Uſes. This Herb hath very great *Virtues* againſt various Diſeaſes, of which you may read more, and find very good Satisfaction, in Volumes that treat of Phyſical Preſcriptions.

(*h*) [*After that Diſeaſe was known in theſe Countries*, &c.]

That *Indian* Diſtemper was propagated in *Europe* after this manner. *Columbus* returning from his Voyage, which he took in queſt of another World, was fraught not only with *Indian* Women, but *Soldiers* alſo to *Naples*, where his Catholick Majeſty was waging War with *Charles* the Eighth, King of *France.* Thoſe Soldiers thro' too much Familiarity with theſe *American* Females, groaning more under an *Infection* than the *Weight* of Money, did communicate Part of their Effects and Merchandize, to thoſe who were engag'd in *Italian* Expeditions. Theſe *Spaniſh* Soldiers being more *ſubtil* than *ſtrong*, and knowing how to be more miſchievous by *Art* than by their *Arms*, went cunningly by Night, and poyſoned their Wells: Nay, not thinking this ſufficient, they brib'd the *Italian* Bakers that ſerv'd the Enemy, to mingle *Lime* with their Meal. And Laſtly, having experienced the Miſery of a contagious Infection, and perceiving it neceſſary for want of Victuals, to baniſh from the City the feeble and uſeleſs, they privately expell'd all the diſeaſed Curtezans tho' never ſo handſome, whoſe charming Beauties did ſo ſtrangely captivate the *French* Youngſters, that they ran Headlong into the *Moloch* of their Embraces, where they were juſtly ſacrific'd to their own Luſts. And their filthy Luxury, did not only infect the whole Army, but ſpread the Contagion thoughout the whole World.

I have either read or heard how certain Merchants being bound to ſerve the *French* Army, at the Siege of *Naples* with ſo many Tun of *Tunny*, and not able to perform it, hearing of a late Battel in *Barbary*, repair'd to the Place, and ſupplied the Quantity with *Man's Fleſh*, dreſs'd in the ſame Manner, which prov'd ſo high a Feeding (moſt eaſily converted into the like) that their Bodies brake forth into loathſome Ulcers; and from that Infection the Diſeaſe that takes from them the Name (not known in our Parts of the World) was introduced among us.

And *Scaliger* in his 181ſt Exercitation againſt *Cardan*, and the 19th Section, doth alſo affirm, that it proceeded not originally from the *Impurity* of Women, but from *Contaction*; and that the *Spaniard* did firſt tranſport theſe rare Wares from the *Indians*, as common among them, as the *Meazels* among us, and equally contagious.

(*i*) [*Indian Figs.*]

Though *Indian* Figs are of many Sorts, ſome thick and ſome thin, and have different Marks of Excellencies; yet they have the ſame Shape, Figure, and Colour, and the Tree it ſelf is as tall as a Man.

Its Leaves (having a *Fibre* in the middle) are an Ell long, and 27 Inches broad. The old ones fall at the coming of new, till the Tree arrives to its full Growth, and bears ripe Fruit. It hath not a *woody*, but a *reedy* kind of Trunk.

This Tree bears a Flower (contrary to the Nature of our Fig-Trees, wherein that is *Milk*, which is a Flower in others; and therefore a Fig-Tree by *Macrobius*, is not ſaid *Floreſcere*, to flouriſh, but *Lacteſcere*, to give Milk,) about the bigneſs of an Eſtrich-Egg, and is of a Purple Colour: From whence, after a long increaſe, there ſhoots forth a Branch, not of a *woody* Subſtance, but like the *Stalk* of a Cabbage, which bears Bunches of Figs, even an hundred Cluſters, and thoſe ſo big, as to be a Load for two Men, and therefore may be better ſtyl'd *Centuple*, than that in *Horace* a double Fig.

Et Nux ornabat menſam cum duplice Ficu.
" And double Figs were on the Table laid.

The Fruit of the *Indian* Fig-Tree, is pull'd before 'tis ripe, when between Green and Yellow. If hung upon a Beam, they will kindly ripen in three or four Days. This *Plant* or Tree bears but one Cluſter, and is preſently cut down, and in a Months Time it will grow again to its juſt Proportion, and is ſo abundantly fruitful throughout the whole Year, that it commonly ſerves the *Indians* for Food.

(*k*) [*Nuts.*]

Though the Trees of theſe are call'd now-a-days *Date-Trees*, by reaſon of that Affinity of Nature which the Former ſeems to have with the Latter, fructifying without a Mate of the ſame kind; yet they are not really the ſame with *Date-Trees*, becauſe theſe are never obſerv'd to grow in *India*, but their Fruit is brought from *Arabia* thither, as we are inform'd by a Phyſician, who liv'd there many Years. And Experience tells us, that the *Date-Tree* (commonly growing in *Aſia* and *Africa,*) will never ſprout in *India*, but as ſoon as ever tranſplanted thither, it becomes barren and unfruitful: So that by thoſe *Date-Trees*, which *Theophraſtus*, *Arrianus*, *Strabo*, and others ſay grow in *India*, we are not to underſtand *Date-Trees* properly ſo called, but *Indian Nut-Trees*, whoſe Fruit the Natives call *Cacao* or *Coquos*.

The *Indian* Nut-Tree is very tall and is about four Fingers thick, having Leaves only at Top, which dilate themſelves as in a Date. Its Fruit lies *ſheltered* under the Covert of its Leaves ſticking cloſe together about ten in Number.

'Tis rare to ſee one ſingle Nut brought forth alone, every one is as big as the Egg of an *Eſtrich*. Its Root penetrates but a little Way into the Ground, but ſticks incredibly faſt conſidering its *Procerity*, which is ſo great, that climbing into the Air with ſo vaſt an Heighth, it *tires* the *Opticks* of gazing Mortals: But the *Indian* Gardeners cut *Stairs* (as it were) in its Rind or Bark, whereby with great Facility they aſcend to the Top, even to the great Amazement of the *Portugueze*, who utterly deſpair of ever mounting to ſo high a Pitch. Theſe Nuts are more plentiful here than Olives in *Spain* and *Portugal*, and are more abundant, than *Willows* in the *Low-Countries*.

This *Indian* Nut-Tree is chiefly admir'd for its Fruit and Wine; the Former when ripe, affords a ſweet and limpid *Juice* that is very cooling, and that ſo copiouſly, that one Nut will go near to fill a Tankard. Neither is a larger Doſe of it any way hurtful, it being very pleaſant and *friendly* to Nature. But if it hang long on the Tree, it coagulates and thickens into an *aluminous* kind of Subſtance, and hardens and drys into a Cruſt or Shell.

Its internal Fruit taſtes ſomewhat like a Filbeard, but is a little ſweeter, and is call'd by ſome *Mexicana Avellana*, a *Mexican Filbeard*. The firſt Rind which incloſeth the inward Fruit, hardens into Wood as the Nutt ripens. If the *Cocoes* were covered with ſuch a Bark, they might be ſafely carried through the whole World; yet in proceſs of Time, this Water is turn'd into a yellowiſh kind of *Rople* very delicious, ſweet, and pleaſant.

The Wood of this Tree is alſo very *profitable*, of which they make Ships, and thoſe without Nails, they being joined together, or rather interwoven by certain Strings and Fibres of the *Cacao*. And (to paſs by ſeveral other Uſes of it) Ropes and Cables are made of theſe Threads, juſt as they are made of Hemp among us. But after fourteen Days at leaſt, they muſt be dipt and kept in the briniſh Waves to keep them from rotting, which they are liable to do in freſh Water, becauſe not ſmeared with a daubing of Pitch.

They weave alſo Sails of theſe Leaves, which *Indians* uſe inſtead of Tyle, and the *Portugueze* for Mats or *Coverlets* againſt the Sun. They make alſo *Hats* of them, which are much eſteem'd by reaſon of their Lightneſs.

(*l*) [*Pictures made of Birds Feathers.*]

By which we are to underſtand that *plumatile* kind of Work, of which ſeveral ſorts have been in the Memory of our Anceſtors, brought to us from the utmoſt Parts of the *Weſt Indies*; as Garments, Shields and various kinds of Veſſels, all which were ſo delicately interwoven with the painted *Plumes* of *Parrots*, *Phœnicopters*, and other party-coloured Fowl, that nothing could be more delightful, or more oblige the Eye, than that pleaſant *Variegation*.

(*m*) [*Knives made of Stone.*]

Writers inform us, that the Inhabitants of theſe Regions, before civilized by the *Spaniards*, uſed (among other Things) *Knives of Stone*, with which they could cut any Thing as well as we can with ours made of *Iron*. This puts us in mind of what we read of the Prieſts of *Cybele*, who were wont to cut of their *Viri-*

litie

lities with a ſharp Stone, according to that in the 4th Satire of *Juvenal*.

> ------ *Ecce furentis*
> *Bellonæ, matriſque Deum chorus intrat, & ingens*
> *Semivir Obſcœno facies reverenda minori*
> *Mollia qui ruptâ ſecuit genitalia Teſtâ.*

" Behold! *Bellona*'s, *Cybel*'s Prieſt, the tall,
" Grave, half Man (with no obſcene part at all,
" A Fiſh-ſhell long ſince cut off that) comes in
" A *Phrygian* Mitre ty'd beneath his Chin.

Some Divines think that a *Stone-Knife*, which was uſed in Circumciſion. And *Zippora* took a ſharp Stone ('tis *Knife* in the Margent) and cut off the Fore-skin of her Son. And God ſaid unto *Joſhua*, make thee ſharp Knives (of *Flint* in the Margent) and Circumciſe again the Children of *Iſrael*. A certain Author informs us, that ſome Stones in the *Indies* were as ſharp as Iron, and did the Work and Offices of Axes and Swords, and of other Inſtruments of that Metal. He tells us alſo, that *Razors* were made of thoſe Stones, which ſupply'd the Uſe of Swords in flaying off the Skin of wild Beaſts; and alſo that great Trees were made hollow to ſail in by the Edge of thoſe Stones.

Some by Stone-Knives, underſtand Blades whetted or ſharpen'd with Stones, or Whet-Stones, as if the Almighty had commanded Razors or Knives to be ſharpen'd with Stones, putting the efficient by a *Metonymy* for the Effect, eſpecially ſince 'tis undoubtedly true, that a Stone-Knife was not neceſſary to Circumciſion, and that the modern *Jews* do not uſe it, but rather a keen and well-ſet Razor.

(*n*) [*Slippers made of* Indian *Ruſhes.*]

There is no doubt but that this *Indian* Ruſh, is the ſame with the *Egyptian Papyrus*, in regard they were equally profitable and both alike; for as that *Egyptian* Ruſh was very convenient for the making of Shooes, and ſeveral Utenſils, as Sails, Mats, Coverlets, and the like, and there was no Vegetable more neceſſary for humane Uſes; ſo the ſame may be ſaid of this *Indian* Ruſh. Queſtionleſs, they had *Slippers* made of this kind of *Bull-Ruſh*, becauſe they were made of *Egyptian Papyrus*. *Herodotus* tells us, that the Prieſts of that Country wore no other.

CHAP. II.

Of Porcellane.

(*o*) THERE was never any *Porcellane* in former Ages. 'Tis a compound of *Gypſum*, beaten Eggs, and the Shells of Lobſters, which being well macerated and condenſed together, is laid in ſome ſecret Place of the Earth, being deſigned by the Father for his Children, without the Knowledge of others.

It lies *buried* for the Space of Fourſcore Years, after the Revolution of which Time, his Sons or Nephews dig it out; who having *kneaded* it again, and made it fit to work on, they frame out of it thoſe exquiſite *Veſſels* moſt beautiful and tranſparent, of what Shape and Colour the Artificer pleaſeth.

Their admirable Nature is conſpicuous in this, that they immediately (*p*) break upon the Reception of Poyſon. He that lays this Maſs into the Earth, never takes it out again, but leaves it as a Treaſure to his Sons, Nephews or other of his Heirs, who gain much by it, it being more valuable than Gold. The true and genuine is very *rare*, yet is it ſufficiently adulterated.

The *Turkiſh* Emperors, Baſha's, and other Governors of Provinces, do continually eat out of theſe double Veſſels, the lower Part whereof is *Silver*, and the upper *Porcellane*, but counterfeit and ſpurious.

The *COMMENTARY.*

(o) [*A Compound made of* Gypſum, &c.]

The Hiſtorians of *China* deſcribe *Porcellane* after this Manner: 'Tis made (they ſay) of an hard chalky kind of Earth, which when well pounded and kneaded, they threw into a Pond mounded about with a ſmooth Wall, where it drinks up the Water till it is ſo moiſtned, as its Surface may be *ſpun* like a fine Web, of which they make moſt pliant *Porcellane*. Coarſer Veſſels are made of the Sediment, which lies at the bottom.

Pancirollus (you ſee) would have them made of Egg-Shells, Lobſter-Shells, and *Gypſum*, laid up in the Earth for 80 Years. This is the Opinion of *Scaliger*, and of moſt Writers. *Ramuzius* in his *Navigations* aſſerts the contrary, and ſaith they are made out of the Earth, and not laid under-ground, but harden'd in the Sun and Wind for 40 Years.

But *Gonzales de Mendoza*, a Perſon employ'd in ocular Experience, deliver'd a Way different from all theſe; for enquiring into the *Artifice* thereof, he found they were made of a *chalky* Earth, which, beaten and ſteeped in Water, affordeth a *Cream* or Fatneſs on the Top, and a groſs

Subſidence at the Bottom: Out of the Cream or *Superfluitance*, the fineſt Diſhes (ſaith he) are made, and out of the *Sediment* the coarſer, which they gild and paint, and not after 100 Years, but preſently commit to the Furnace.

This (ſaith he) is known by Experience, and more probable than what *Odoardus Barboſa* hath delivered, that they are made of Shells and buried under Earth 100 Years. And anſwerable in all Points, hereto is the Relation of *Linſchotten*, a diligent Inquirer, in his *Oriental Navigations*.

Alvarez the Jeſuit, who lived long in theſe Parts, in his Relations of *China* tells us, That *Porcellane* Veſſels were made but in one Town in the Province of *Chiamſi*; and that the Earth was brought out of other Countries, but for the Advantage of Water, which makes them more polite and perſpicuous, they were only made in this; and that ſome of them were tinctur'd blue, ſome red, others yellow, of which Colour only they preſented to the King.

(p) [*They break upon the Reception of Poyſon*, &c.]

Some aſcribe the ſame Property and Virtue to *Electrum*, which is a Mixture of Gold and five Parts Silver. A Cup made of this, will by a *ſpotted Arch* in its inward Surface, obſcuring and clouding its native Brightneſs and Purity, diſcover and ſhew the infuſed Poyſon.

That *Porcellane* will not endure Poyſon, not only *Pancirollus*, but one *Simon Simonius*, chief Phyſician to *Maximilian* Archduke of *Auſtria*, doth alſo aſſure us in certain Letters, which he ſent with *Porcellane* from *Prague* to a Kinſman at *Leipſick*.* His Words are theſe:

> “ I have ſent a Diſh of precious *China*, which
> “ was found among other Things in a Cheſt of
> “ the Baſha of *Buda*, who is now a Priſoner at
> “ *Vienna*. The *Turks* drink Water, Sherbet, and
> “ other Broths out of it, becauſe by a ſudden
> “ Alteration and Change in its Tranſparency,
> “ it is ſuppoſed to diſcover, and powerfully to
> “ reſiſt Poyſon. I ſhall not exchange it for a
> “ Veſſel of *Silver* of the ſame Weight, for I am
> “ certain it is pure and genuine, and not in the
> “ leaſt *adulterated*, which is very probable, be-
> “ cauſe uſed by ſo *illuſtrions* a Perſon among the
> “ *Turks.*

Salmuth himſelf had this in his Hands at *Leipſick*, and drank out of it many a pleaſant Draught of Generous Wine. And he found the fore-mentioned Deſcription to be very true, *Cryſtal* it ſelf cannot baffle *China* or *Porcellane* in Tranſparency.

C H A P. III.

Of the Bezoar-Stone.

(q) THE *Bezoar-Stone* was altogether unknown in former Times. Some take it to be the *Tear* of an Hart; who having eaten Serpents, throws himſelf into the Water to digeſt his Poyſon, where weeping ſorely, his condenſed Tears are ſuppoſed to be *Bezoar-Stones*, and are called ſo.

But very falſly; poſſibly thoſe Tears might have the ſame *Virtue*, but they are not really the ſame *Stones*, which are generated in *Mauritania*, and are very great Antidotes againſt Poyſon.

ſon. If you take but twelve Drams of it in Wine, it preſently expels, and ſuddenly puts to flight all kind of Venome.

Another of its Effects is this; if it be laid upon the *Bite* of a Serpent, it ſecures from the Malignity of any kind of Poyſon. It is good againſt the Plague and Peſtilential Fevers, and is a ſovereign Thing in many Infirties and Diſeaſes. The *Arabians* were acquainted with the Nature of it, as *Rhaſis* who wrote a Treatiſe concerning it; he lived in the Reign of *Almanzor*, that Potent King of *Mauritania*, whoſe Power was ſo great, that his Dominions extended through all *Africa*, in length as far as to forty Days Journeys, and in breadth fifteen, and he commanded likewiſe a great Part of *Spain*. The *Latins* and *Greeks* were utterly ignorant of this precious Stone.

The COMMENTARY.

(q) [*Bezoar-Stone.*]

This Stone hath divers Names; 'tis call'd by the *Arabians* and *Perſians*, *Pazar a Paſan*, which ſignifies a Goat; by the *Indians*, *Bezar* or *Bazar*, and *Lapis Forenſis*, a Forinſick Stone, for *Bazar* ſignifies *Forum*; by the *Hebrews*, *Bel-zaar*, *i. e.* The Lord of Poyſon, *Bel* ſignifying Lord, and *Zaar* Poyſon, againſt which 'tis a preſent Remedy.

Theſe Stones are of ſeveral Shapes, as round, oblong, and ſome like the *Eggs* of Ring-Doves, and Goats *Kidneys*, and others like Cheſtnuts; but they are all obtuſe and *blunt*, none being ſharp or *pointed*.

Neither do they leſs differ in *Colour*, they are not of a light and lively red, ſometimes inclining to a dark yellow, but for the moſt Part are *clouded* with green, not unlike putrify'd or rotten Apples; but chiefly (like Civet-Cats) they are of a dusky, obſcure, and Aſh colour Hue.

They conſiſt of ſlender *Plates* and thin *Slivers*, like the Coats of Onions, moſt artificially infolded one within another, and Shining with a Luſtre, as if they were poliſh'd; upon the Removal of the out-moſt, the next is brighter; and ſome of theſe *Films* are thicker than others, according to the bigneſs of the Stone.

Theſe Stones are ſmooth and pleaſant, and will admit of *ſhaving* eaſily like *Alabaſter*; nay, if they lie long in the Water (according to ſome) will diſſolve and melt. They have no Heart, but are hollow in the middle, and are full of Duſt of the ſame Matter with themſelves, which is much commended, and is preferr'd before the Stones.

And as they differ in *Figure* and *Colour*, ſo alſo in *Weight* and *Subſtance*: Some are lighter than others of the ſame Bigneſs (ſome weigh four, ſome twelve, and ſome fifteen Drams, and ſome more) and ſome more ſolid; ſome have fewer, and ſome more Skins and Films; ſome have Duſt in their Middle, and others ſomething like a dry Herb. In the Centre of ſome you may find a Straw, about which ſome fancy the Stone grew.

Some affirm it to be generated in the Corner of *Harts* Eyes; telling us, that in the *Eaſt* old Harts devoured Serpents, by which Sort of *Viands* they retrieve their Youth; and to overcome the Poyſon, they plunge into the Water all but their Head; where remaining a while, a clammy kind of Humour falls from their Eyes, which by the Heat of the Sun, hardens into Stones (like Walnuts) which drop on the Ground as they come out of the Water. This is the receiv'd and common Story.

But others inform us, that *Bezoars* are taken out of a certain kind of Animal, in Bigneſs and Swiftneſs reſembling an *Hart*; but in his Horns bending backward, and in the Shape of his Body almoſt like a *Goat*; and therefore 'tis call'd *Capra Montana*, a Mountain-Goat, tho it rather may be ſty'ld *Cervi-Capra.* It hath ſhort Hair of an aſhy-yellow Colour. The *Bezoar* is generated in the Ventricle of this Beaſt, increaſing and growing about a ſlender Straw, and woven (as it were) of many Tunicles.

This Animal is found about *Ganges*, in the Mountains adjacent to *China*, and alſo in *Perſia* in the Promontory of *Comoris*, and in ſome of the *Molucca*'s, and ſometimes in *Peru.* A very late Traveller informs us, that *Bezoar* is found five Days Journey from *Golconda* towards the Eaſt in the Province of *Renquery*, and is ingender'd in the Paunches of a *Goat*, ſome of which have twelve Stones in them. The Inhabitants of the Country, eaſily know how many Stones the Goat hath lodg'd in his Body by this Means. They ſtroke the Belly of the Goat with their Hands, and rub it till the *Bezoars* come all to the Bottom of the Paunch, and then they may be felt, and counted like little Stones in a Bag. There come alſo *Bezoar*-Stones from the Kingdom of *Macaſſar*, in the Iſles of *Celebes* at five Degrees of Southern Latitude near the *Molucca*'s, but they are ſound in the Bodies of *Apes*, and are not ſo large as thoſe of *Golconda*.

A Gentleman living about twenty-eight Years in theſe Countries, writes to his Friend, that he ſaw thoſe Animals out of which comes the *Bezoar*, and ſaith, they are very like *Goats*, only they have no Horns; and are ſo ſwift, that they are forc'd to ſhoot them with Guns. He tells us, that he and ſome Friends on the 10th of *June* 1568. hunted ſome of theſe Creatures, and in five Days kill'd many of them; and that in one of the oldeſt of them, they made diligent Search for this Stone, but found it not, neither in the Ventricle, nor in any other Part of the Animal. They ask'd the *Indians* that attended upon them, where theſe Stones lay; they denied that they knew any Thing of them, being very envious, and unwilling to diſcover ſuch a Secret. At length (he ſaith) a Boy about twelve Years old perceiving us to be very inquiſitive, and to be very deſirous of Satisfaction in that Particular, ſhew'd us a certain Receptacle and (as it were) a *Purſe*, into which they receive their eaten Herbs, which afterwards when chew'd, they convey into the Ventricle.

'Tis ſtrange that this Animal is not to be found throughout the whole *Weſt-Indies*, but only in the Mountains of *Peru*. This Perſon travell'd through all its Regions, and never ſaw any but in that Place. Thoſe breed the beſt Stones that feed in the Mountains. They took nine Stones out of the *Pouch* of one Animal, which by the help of Nature, ſeem'd to be made of the Juice of thoſe ſalutiferous Herbs, which were cramm'd up into this little *Pouch*.

As for the *Virtues of Bezoar-Stones*, Writers tell us, that the *Indians* uſe them againſt Medicines of a *deleterious* Quality, but the Inhabitants of *Ormuz* uſe them againſt *Bites* of ſavage Beaſts, and alſo againſt all Melancholy Diſtempers. And becauſe the Small-Pox is very fatal in *India*, they were wont to give daily to the Sick Patient, a Grain or two of the Duſt of *Bezoar* with very good Succeſs.

They tell us, that not only taken inwardly, but outwardly apply'd, it doth wonderfully reſiſt, and is a very great Antidote againſt the Powers of Poyſon; inſomuch, that *Mathiolus* thinks it conquers all Poyſon, if ty'd or bound to the left Side naked. It is manifeſt (they tell us) that its *Duſt* or *Powder* applied to a Wound, will heal thoſe that have been hurt by *mortiferous* Animals; it hath the ſame Virtue if laid on *Plague-Sores*; for it ſucks out the Poyſon. And its Powder alſo is very good for Wounds feſter'd with poyſon'd Arrows.

It doth not only revive, and is a refreſhing *Cordial* to fainting Spirits, but is a very good Medicine to expel Worms; and is a Sovereign *Antidote* againſt that moſt fatal kind of Poyſon, wherein the *Indians* dip their Arrows to deſtroy both themſelves and the *Spaniards* too.

Many given over by the *Phyſicians*, have recover'd by the Help of this *Stone*, and this is confirm'd by many Inſtances; for a Dram of it *pulveriz'd* given to a Malefactor at *Prague*, immediately reſtor'd him. A Gentleman being ſenſible of his ſinking into a *Swoon* without preſent Help, took five Grains of *Bezoar* in a little Wine, and was immediately reviv'd again into his former Vigour. At *Vienna*, the Emperor commanded a *Bolus* of half a Dram of pulveriz'd *Arſenick* and *Conſerve of Roſes* to be given to a Malefactor condemn'd to die, who about an Hour after drinking ten Grains of *Bezoar* diſſolved in Borage-Water, was preſently reſtor'd to his former Health.

As for the *Value* of this Stone, none need wonder that it is ſo highly priz'd, ſince a certain Author tells us, that he had one, which though it weighed but five Drams, yet it was bought in *India* for above ſixty *Hungarian* Crowns. They were in ſo great Eſteem among the *Indians*, that they hung them in the Temples of their Idols, and offer'd Gold and Silver, Jewels and Animals, Boys, *&c.* and all precious Things imaginable to them. They ſell them by Weight, and the Bigger the Stone, the better and the dearer. In the Year 1660 there were ſold of them to the Value of 100000 *Franks*, and the greateſt Part fell to the *Engliſh*.

The way to know the *Genuine* from the Spurious, is to cruſh them with your Hands, and to breath upon them; for if any Air remain, 'tis a Sign (they ſay) they are adulterate. Another Way is this; they draw a Needle and Thread through Poyſon, and then thruſt it into a Dog's (or any other Animal's) *Foot*, and leave the Thread in the Wound. The Dog preſently perceives, and feels the Symptoms of Poyſon, who ſeeming to be deſperate, they put into his Mouth the Powder of *Bezoar* diluted with Water. If it doth the Dog any good, then they conclude it to be legitimate, and *Genuine*; and if not, it is ſuppoſed to be *falſe* and altogether ſpurious.

Others make this Mark or *Criterion* of its Goodneſs, *viz.* If when the firſt *Sliver* or Tunicle (let me ſay) is taken away, the ſubſequent *Film* is brighter, and hollow in the Middle, and is full of its own Duſt, 'tis a Sign 'tis right; for thoſe that are counterfeit, neither ſhine, nor have any Powder in them, but a little Grain or Seed, upon which the *Indians* did artificially make them. This is thought by ſome the moſt infallible Way of trying theſe Stones, *viz.* Take a little Quick-Lime in your Hand and mix it with Spittle, and rub it with this Stone, and it will become yellow.

CHAP. IV.

Of Rhubarb *and* Caſſia.

THE Uſe of *Rhubarb* in Medicines, was not known, nor the purgative *Caſſia*; tho' I do not deny, but that they did exiſt. I ſhall ſay nothing of their *Virtues*, but ſhall leave them to Phyſicians.

The *COMMENTARY.*

Rhubarb is an excellent Medicament, and is very much eſteem'd and uſed by Mankind. *Dioſcorides* calls it ſometimes *Rheon*, and ſometimes *Rhian* and *Rhaponticum*; *Galen* calls it *Rheum* and *Rha*; *Pliny*, *Rhacoma*; *Celſus*, *Radicem Ponticam*; the *Carthaginians*, *Ravedſceni*: But the whole Tribe of Phyſicians, and all the Sons of *Æſculapius*, commonly call it *Rheubarbarum*, *Rheobarbarum*, and *Rhabarbarum*.

Some ſay there is no *Indian Rhubarb*, but only that which comes from *China*, and grows in the internal Parts of the Country, in the City *Cantan*, the moſt famous Mart and Haven of the Province, inhabited by the *Portugueze*. 'Tis imported from thence into *India* by Ships and Camels; through *Tartary* and *Uzbeque* into *Ormuz*, and from thence into *Perſia*, *Arabia*, and *Alexandria*, and ſo communicated through the whole World. That which is brought by Beaſts on *Land* is leſs corrupted, than that which is brought by *Sea*.

The *Rhubarb* of the ancient *Greeks*, *viz.* of *Dioſcorides*, *Galen*, *Theophraſtus* (whom *Pliny* follows) and of the ancient *Arabians*; namely, *Serapion*, *Avicen*, *&c.* much differs from that of modern *Arabians*, *viz.* of *Joh. Meſues*, and of the modern *Greeks*, *i. e.* of *Actuarius*, *Paulus*, *Nic. Mirepſus*, and others. And that 1. In *Place*, for the *Rhubarb* of the Ancients was brought from Northern Regions, where are the Rivers *Boſphorus* and *Rha*, which gave it its Name, as *Dioſcorides* informs us, but the *Rhubarb* of the Moderns comes from the South. 2. In *Colour*; for the *Rhubarb* of the Ancients, was like black *Coſtum*, called *Herba Mariæ*, but that of the Moderns is not at all like it, but is rather yellow. 3. In *Smell*; for the *Rhubarb* of the Ancients, by the Deſcription of *Pliny* and *Dioſcorides*, had no Smell; and therefore was called by *Galen*, *Radix inodorata*, but that of the Moderns is very fragrant. 4. In *Weight*; for the old *Rhubarb* was light, but the new is heavy. 5. In *Virtue*; for that of the Ancients was not Purgative, but that of the Moderns is very looſening. *Dioſcorides*, *Pliny*, and *Galen*, nor any of the Ancients did uſe it for a Purge, but rather aſcrib'd to it an Aſtringent Quality. See more of the Nature of this Herb in Botaniſts, and among learned Phyſicians.

(*r*) [Caſſia.]

Caſſia, is the Fruit (about the Bigneſs of a Pear) of a Tree that hath Leaves like a Beech, but ſomewhat narrower, and more Verdant; very much reſembling the Flowers of Broom, being of a dirty Colour, and ſmelling like Clove-Gilly-Flowers. After the Fall of theſe Leaves there ſhoot out long Husks or Cods, very green before they are ripe, but when come to Maturity they grow black, and are ſometimes five, but ſeldom leſs than two Spans long.

Caſſia doth not only grow in all the Provinces of *India*, but in *Egypt* alſo, from whence 'tis called *Siliqua Ægyptia*; and from its Shape and Figure, *Fiſtularis*; and from its Effect, *Solutiva*, Looſening. And becauſe it grows in woody Places of its own Accord, without being ſown, it is no Wonder there is ſo large an Increaſe of it, as to ſuffice all Europe; nay, the whole World too. Neither is it brought out only of the *Eaſt-Indies*, *Memphis* (or *Cairo*) and *Alexandria* in *Egypt*, but alſo out of *America*, from the Iſles of *San Domingo* and *S. John*, and is carried back again into the Eaſt from whence it firſt came.

There are two Sorts of *Caſſia*. 1. *Arabian*, of which we now ſpeak: And 2. That of the ancient *Greeks*. *Arabian Caſſia* grows partly in *India*, and partly in *Egypt*, and differs from the other in its Deſcription, Uſe, and Virtues.

1. In its *Deſcription.* For it hath round Cods or Husks ſharp at both Ends, whoſe inward Subſtance is black, of a ſweet, luſcious, and phyſical Taſte; whereas that of the ancient *Greeks* is red, and ſmells like a Roſe, and hath a ſweet Taſte, and is *Fiſtular*, having a *vinous*, aromatical Smell.
2. In its *Uſe.* For the *Arabian*, which is ſold in Shops, is uſed *ad leniendam Alvum*, but the other is not, but is *Diuretical*, and hath other Vertues different from the former. And therefore that *Caſſia* the *Arabians* write of, was altogether unknown to the ancient *Greeks*; neither doth *Galen* or *Dioſcorides* make mention of it; ſo that, if in the Books of the *Greeks*, you read of this *Fiſtular-Caſſia*, it is not to be underſtood of that which the *Arabians* and Moderns treat of, which is looſening (*Solutiva*) but of *Caſſia lignea & Odorata*, *i. e.* Woody and Odorous.
3. In *Virtues.* Of which you may conſult many Learned Phyſicians, and particularly, that dapper *Quack Salver*, honeſt *Nich. Culpeper.*

CHAP. V.

Of Sugar.

(ſ) THERE was formerly *Sugar* among the ancients, but it was not much known; neither was it uſed, but only in the Compoſition of Medicines. The Manner of making it, was found out ſome hundreds of Years ago; And in this our Age, there was one at *Venice*, who invented the Art of Refining it, who got by the Invention above an hundred thouſand Crowns; all which Wealth he left to his Son, who for all his Knighthood, ſoon ſquander'd it away, and made it fly with thoſe Wings, which *Solomon* gives to Riches.

That Art now is arriv'd to ſuch Perfection and Curioſity, that Rhubarb, Pine-Nuts, Cinnamon, and many other Things are candied with Sugar, and are preſerv'd freſh and good.

(*t*) There are made of Sugar ſeveral Sorts of Figures, and pretty Images and Pictures; and alſo all Sorts of Fruits are repreſented ſo lively, that they ſeem to be natural, which Thing could not be done formerly by the Ancients, by reaſon (I ſuppoſe) of the Scarcity of Sugar.

The *COMMENTARY.*

(*ſ*) [*There was formerly Sugar*]

'Tis a Queſtion, Whether the *Sugar* we uſe now a-days, was known to the Ancients. *Quercetan* tells us, that he cannot gather from the Writings of *Hippocrates* and *Galen*, that they had any Knowledge of it.

We muſt diſtinguiſh of Sugar: There is that of the Ancients, and that of the Moderns; the former was a kind of *Honey*, and thereſore the Ancients ſpeak of it amongſt Honey: For *Dioſcorides*, *Galen*, and *Pliny* do all unanimouſly agree, that this kind of Sugar is a ſort of Honey condenſed, whoſe Canes are to be found in *India* and *Arabia Felix*.

Seneca tells us, that among the *Indians*, there was Honey to be found on the Leaves of Reeds; and that that *melleous* kind of Dew, harden'd and congeal'd (like Salt) on Canes or Reeds, call'd by *Archigenes* (an ancient Writer) *Mel Arundineum*, and frozen to the Reeds by the cold of the Night, hath the Reſemblance of a ſort of Honey, and was ſtyled by *Paulus Ægineta*, *Sal Indus*, becauſe when condenſed it appears like Salt.

Alexander Aphrodiſæus ſaith, that that which the *Indians* call *Saccharum*, is a *Coagulum* of Honey. *Archigenes* and *Paulus Ægineta*, ſhew that the firſt ſort of Sugar among the Ancients, differs nothing from the *Indian* Salt, and they call it by that Name, and alſo *Reedy* Honey.

A Second ſort of Sugar among the Ancients, and known to Primitive Writers, was that which was ſqueez'd from certain *Reeds*, or from their Roots, which they us'd as Honey in their Diet; and therefore it was call'd by ſome *Moors*, *Mel cannæ*, and was brought chiefly out of *Egypt* and *India*.

And that this was known to the Ancients, is clear from *Lucan*, who in his 3d Book makes mention of it.

Quique bibunt tenerâ dulces ab arundine Succos.

“ And quaff'd ſweet Juice from tender Reed.

And alſo from *Statius*

—— *Et quas præcoquit Eboſia Cannas.*

—— “ Canes which *Eboſia* boil'd.

And *Strabo* tells us, that thoſe kind of Reeds, were not only *cruſh'd*, but *boil'd*. And *Galen* mentions thoſe *Egyptian* Reeds, out of which was ſqueez'd a *melleous* kind of Liquor.

As for our *modern Sugar*, it is a Juice ſqueez'd from a well-bruiſed Plant more or leſs excocted and purify'd by the Heat of the Fire. The more it is boil'd the finer and whiter it is, and according to its ſeveral Boilings, 'tis endowed with ſeveral Degrees of Goodneſs. They firſt boil this Vegetable, that is ſo like a Reed, ſo that the yellow Part is ſever'd from it, and then it becomes Sugar. And this they boil again, and then it grows whiter. They boil it a third Time, and then it arrives to a greater Whiteneſs and Hardneſs too: Nay, they are wont to boil it till it be tranſparent like *Sciſſile Alumen*, and this they call *Candidum*, and barbarouſly *Candum* and *Taberzeth*. *Sugar-Candy* is a factitious or artificial Thing made of Sugar boil'd four or five Times over.

Our Sugar differs from that of the Ancients: 1. In *Matter*, for theirs was made of Honey and Dew, but ours of the Juice of a Cane. 2. In *Form*; for theirs (as to its Conſiſtence and Concretion) was fragil and brittle like Salt; and *Pliny* ſaith, was white like Gum: But ours, before 'tis boil'd, is rather of a dusky, yellowiſh Colour than white; neither can it be broken by the Teeth, but melts in ones Mouth. 3. In the *Efficient*; for theirs was condenſed by the nocturnal Cold, and was afterward hardened by the Heat of the Sun: But the Efficient Cauſe of ours is the Vegetable it ſelf, and the Heat of the Fire boiling and purifying it. 4. In *Place*; theirs grew only in *India* and *Arabia Felix*, on the Leaves of Reeds, and on Reeds themſelves:

But ours is to be had in the *Sicilian* and *Canary* Iſlands, where the *pulpous* Subſtance, or Pith of a Plant like a Reed contains Sugar. 5. In *Uſe*; They us'd Sugar only in Phyſick, but we in Banquets alſo; ſo that there can hardly be a Treatment ſweet and ſplendid without this Delicacy. 6. In *Virtue*; The Sugar of the Ancients was diſobliging to the Belly, but endearing to the Stomach: But ours on the contrary, is more friendly to the Latter than 'tis to the Former.

There was another kind of Sugar among the Ancients, which was preſs'd from Canes or Reeds. And indeed, ours doth not differ any way from it, in regard it is the Juice of the fore-mentioned Vegetables. However they differ in ſome reſpect, in that Antiquity ſqueez'd it from Canes, (though ſometimes, as we ſhew'd you from *Strabo* and *Statius*, they extracted it by boiling;) whereas ours is made thus: The Sugar Canes being beaten and ſmaſh'd ſmall, are boil'd till the whole Liquor is condenſed into Sugar ſticking like Salt to the Sides of the Veſſel, hard and white.

From whence it is manifeſt, that our Fore-Fathers were not ignorant of this Way of Boiling it, but would not uſe it, becauſe that Juice made a pleaſant ſort of Drink. And it ſeems, they had rather have a Cup of good Liquor, Nappy and Potent, to make them *Merry*, than a *Conſiſtence* of Salt to make them *Dry*.

As for the Virtues and uſe of Sugar, there are but few that are ignorant of them. It conquers the Auſterity and rebates the Edge of harſh and ſharp Things. It mollifies the Acrimony, and makes meek the Crabbedneſs of tart and ſour Things. It ſweetens Briniſh, and gives taſte and reliſh to inſipid Things. In a Word, it ſeems to tame and to triumph over all *Sapids.*

(t) [*Made of Sugar ſeveral Sorts of Figures.*

How many Shapes and Images of Fruits and Plants, of Beaſts and Birds, are to be ſeen in the Shops of ingenious *Confectioners!* How many Seeds lie buried and entomb'd in the Cruſt of them, and all to gratify and pleaſe the Palate, and to advance the Pleaſure of Mankind!

CHAP. VI.

Of Manna.

(u) *MANNA* was not unknown to *Virgil*, who calls it *Roſcidum Mel*, Honey-Dew, nor to *Pliny*, *Galen*, and others: But in my Opinion, they were ignorant of its Virtues, and therefore did not uſe it in their Medicines. And I ſuppoſe *Averroes* and other *Arabians* would have it ſo, who wrote that it was altogether unknown before their Time. It is not only delicious of it ſelf, but it ſweetens the Bitterneſs and chaſtens the Severity of other Medicines.

There are other *Simples* now a-days in Uſe, which were not at all known to the Ancients, but they are ſuch as are not very conſiderable; I ſhall therefore omit them, and proceed to treat of ſome certain Arts, and firſt of *Chymiſtry.*

The *COMMENTARY.*

(u) [*Manna.*]

We muſt diſtinguiſh of *Manna*, there is that of the ancient *Greeks*, and that of the *Arabians.*

I. The *Greeks* underſtood by *Manna*, nothing but the Powder or Duſt of pounded *Frankincenſe*, mingled with a little Bark of the ſame, *i. e.* ſome ſmall Particles rubb'd off by Motion from the little *Moleculæ* or Clods of Frankincenſe blended with the Fragments of its Rind, and therein it differs from the meer Duſt or Powder of the ſame.

II. The *Manna* of the *Arabians*, is a Subſtance deriving its Original from Dew, made into little white Grains of a Solid Conſiſtence, and of a pleaſant Taſte; ſometimes falling on the Leaves of Trees, and ſometimes on the Ground; of this we ſhall conſider the *Name* and *Form*, the *Colour* and *Birth-Place*, the *Merchandiſe* and *Traffick*, the *Duration* and *Age*, the *Time* and *Manner* of its Generation, and the ſeveral kinds of it, and ſome Inquiry about it.

1. As for the Name of *Manna*, 'tis a *Chaldee* Word, an Interjection of Admiration deriv'd from the *Hebrew Manhu*, *Quid eſt hoc?* What is this? The *Arabians* in their own Dialect, call it *Tereniabin* and *Termiabim*. Some call it *Aerial* Honey, and a *melleous* Humour, *Mel & Manna Roris*, Honey or Manna-Dew, to diſtinguiſh it from *Manna Thuris*. Others ſtyle it *Mel ſylveſtre*, and 'tis frequently mentioned in *Pliny* and *Galen*, in *Theophraſtus* and others by the Name of *Rorid* Honey.

2. As for its *Form*, the *Conſiſtence* of it is a concreted Juice, which being condenſed from its *Fluidity* into a ſolid Firmneſs, is ſhaped according to the Figure of its circumambient Body; So that its Figure is uncertain, though it uſually imitates two Forms. For Juices are moſtly concreted either into *Globules* or *Icicles*.

into little Globules, when the Drops are too thin to be diffus'd, for then Nature reſtrains and confines a fluid Body into narrow, and thoſe Sphærical Bounds: But when the fluid Juice is more copious, then it is congealed into *Icicles*.

3. Touching its Hue, 'tis generally of a ſnowy, and ſometimes of a yellowiſh and Honey Colour, and hath a ſweetiſh Taſte, not unlike that of Sugar. If you ſprinkle a coarſer Sort of Sugar on pure and Virgin-Oil, and mix them with Flower of *Sweet-Almonds*, you will make a Compoſition that taſtes like *Manna*.

4. As for the *Birth-Place* of *Manna*, 'tis gather'd in *moſt*, if not in *all* Parts of the World. 1. In *Europe*, *Valeſius* tells us, that it rain'd *Manna* in *Spain*. It is to be had in ſeveral Parts of *France*, as in the County of *Burgundy*, *&c.* and in the Low-Countries, as ſeveral Authors inform us. And as *Italy* excels many Countries of *Europe* in other Things; ſo principally in this, there is a wonderful Increaſe and Plenty of it in *Calabria*, neither are other Places deſtitute of it. In the Year 1622. there fell ſuch a Quantity of it at *Pavia*, on the Grove near the Monaſtery of the *Holy-Croſs*, that the Fathers of the Society were forced to cut it down to be freed from the flies, which were a very great Nuſance and offenſive to them. Thoſe liquoriſh Creatures did ſo ſwarm to thoſe Dainties, that they corrupted the Air, and made it ſtink as much as the Manna was ſweet. 2. 'Tis gather'd alſo in *Aſia*, in very great Quantities among the *Perſians*, and alſo in *Africa*.

5. The *Merchandiſe* of *Manna* is much exerciſed in the Marts of *Venice* and *Genoa*, whither 'tis brought in great Plenty from *Apulia*. *Oriental*

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tal Manna is ſold at *Alexandria* in *Egypt*, and at *Aleppo.* The *Aſiatick*, at *Ormuz*, *Aden*, *Malaca*, all famous *Indian* Ports. The *African* is tranſported toward the Middle of *Lybia*, and there is no ſmall Quantity of it at *Algiers.*

6. The *Time* of gathering it is in the *Twilight*, from the Riſing of the *Pleiades* (in the Beginning of *April*) to their ſetting in *November*. There's no Hopes of getting it after they are ſet. It falls in the Morning before Day-light, and is condens'd by the Cold, and harden'd by the Sun, which is peculiar to the *Calabrian* and *Perſian* Manna; for the longer it *Tipples* and Drinks in the Sun-beams the harder it grows; whereas other Kinds, unleſs gather'd in the Morning, cannot endure the *Embraces* of that warmer Planet.

7. There are ſeveral Sorts of Manna. 1. *Oriental*; And 2. *European.*

1. *Oriental* is that which is brought from the Eaſtern Parts, and is either liquid or dry. 1. The *Liquid* is called in *Arabick Tereniabin*, and is uſually preſerv'd in Earthen Veſſels. 'Tis call'd by ſome (and that not improperly) *Mel Aereum*, *Mel Cedrinum*, *Mel Roſcidum*, *Ros Libani*, *Ros Melleus*, *i. e.* Aereal, Rorid Honey, an Honey-Dew, and the Dew of *Libanus.* Some of this hath been ſeen to have been brought from the Mart of *Ormuz* to *Goa* in Bottles, and was not much unlike white refin'd Honey. There is a ſecond Sort of this liquid *Manna* of an Honey-like Taſte, which the *Perſians* call *Lac Arborum*, the Milk of Trees, from whence it diſtils and falls like Dew. There is a third ſort mention'd by *Q. Curtius* in his 6th Book, *Near the* Caſpian *Sea*, ſaith he, *there was great Store of a*

ſort of Trees like Oaks, whoſe Leaves were covered with Honey, which the Inhabitants gather before Sun-Riſing, leſt the Moiſture ſhould be dried up by the Heat of the Sun. This liquid Manna, becauſe of no great Value, is not any where now a-days preſerv'd. 2. Arid or dry and hard Manna, is kept in wooden or glaſs Cheſts, or Repoſitories; of this there are ſeven Sorts, (1.) Of Mount *Libanus*, whoſe Operation is ſo ſmall, that the Inhabitants eat it inſtead of Food. (2.) *Maſticinum*, from a Grain of Maſtick, which it doth not a little reſemble. 'Tis call'd by ſome *Viſcid* from its Clammineſs, and by others *Manna Granata*, from its Figure and Manner of Concretion. This *Maſtick Manna* is thought to be the beſt. (3.) *Bombycinum*, which is cheaper and of a bigger Grain, and is like a lock of Silk, (from whence its Name) and is nothing elſe but the Carcaſs of decay'd *Maſtick-Manna*, adulterated with Sugar and other Sophiſtications. (4.) *Teremiabin* in *Arabick*, which is ſhaken from Thiſtles, and conſiſts of Grains about the bigneſs of Coriander-Seed. The 5th Kind is brought on Boards by the *Perſian* Merchants from the City *Bozora*, mixt with Leaves, it differs not much from *Calabrian.* The 6th Sort taſtes like Sugar and pure Oil, and comes from the Kingdom *Ziſara* in *Africa*, The 7th Kind comes from *Ayadez.*

2. *European* Manna, is *Gallican*, and *Calabrian*, which is the moſt *ignoble*, and leſs virtuous, by reaſon of the Faintneſs of the Sun-beams. And this is, 1. *Foliaceous*, which ſticks to the Leaves of Trees, and is pellucid and heavy, white and ſweet, and luſcious to the Taſte, conſiſting of little Grains. 2. *Truncous*, which flows from

Trees when cut down. 3. *Terreous* or *Lapideous*, which is gather'd from the Stones or Earth, and drops from the Leaves or Branches of Trees. This hath thicker and groſſer Grains, and is not of ſo pure and ſincere a Colour, and therefore not ſo good as the former.

As for the *Duration* or *Age* of Manna, that which is oriental, dry and hard, is more *efficacious* than *Calabrian*, but keeps not its Virtue above a Year. In *Syria* and *Cairo*, tho' *Maſtick* Manna hardly laſts a Twelvemonth there in its native Place, yet with us, if expos'd to the Air, it decays in a Month, and degenerates into *Bombycinum*. *Apulian* therefore is fitter for uſe, which retains its Virtue, not only one, but five Years, and then grows weak, and loſeth its Strength.

In the Choice of *Manna*, we muſt have regard to its *Age*, the Place of its Nativity, and to the Tree from whence it falls; for it gets ſomewhat from that upon which it drops, and acquires Virtue by Contact; that therefore is the beſt which is found on Trees, becauſe it gathers nothing from them.

That which is found on the Trunks of Trees, is not ſo good as that which reſides on the Leaves, though it far exceeds that which is taken from Stones or the Earth, and that which drops on *Stones*, is better than that which falls on the Earth, becauſe this is more eaſily corrupted; and therefore ſometimes they lay pure *Wooll* under the Trees from whence it diſtils. That is the beſt which is freſh and ſhining, whitiſh, and condens'd into the pureſt Clods, and of Honey-like Sweetneſs, gather'd from odoriferous and wholſome Shrubs, not mix'd or entangled with Leaves or Twigs. That is *naught* which is of an aſhy Colour, but that worſt of all, which is blackiſh, dirty and old.

There are ſeveral Opinions about the Generation of Manna: The firſt is of *Galen*, (which many favour) who holds a Vapour ariſing from the Earth and Water, to be the *material* Cauſe of it, and the Sun to be its *efficient*. They much reverence this Sentiment, who inſiſt only on the *general* Principles of Philoſophy, and deſcend not to Particulars.

The ſecond is of *Pliny*, who tells us in a Rhetorical or Poetical Strain, that Manna is aerial Honey, and the *Sweat* of Heaven, the *Spittle* of the Stars, and the *Juice* of the purify'd Air.

The third is of one *Chriſtopher à Vega*, who would have it be generated from a certain kind of *Fly*. The third is *Anthony ab Altomaro*, who will not have it a *Meteor*, but a *Gum*, a reſinous kind of Subſtance iſſuing from Aſh-Trees. The laſt Opinion would have it a kind of Salt, ariſing in Streams from its own proper Mine, and falls down upon Trees that grow near that Place.

You may find all theſe Opinions largely confuted by *Magnenus*, in his little Tractate of Manna, who afterwards lays down his own, which is, that the proximate, immediate material Cauſe of Manna, doth chiefly conſiſt of five Ingredients, *viz. Primogenial*, or Virgin-Wax and *Honey*, a *Rorid Vapour*, *Sal Nitre*, and *Sal Ammoniack*. This Poſition he excellently explains in the above-mentioned Treatiſe, to which we refer the curious Reader.

That the Manna of the *Iſraelites* was the ſame with ours, *Valeſius* affirms in his Book of *Sacred Philoſophy*. But there are many Arguments perſuading the contrary in *Magnenus*.

(*w*) [*Manna was known to* Pliny, Galen, *&c.*]

Whether the *Arabian* Manna was known to the ancient *Greeks* or not, is much controverted. Some ſay not, becauſe the Name is not ſo much as mentioned among them, and becauſe they never aſcrib'd this purging Faculty to any thing like it; and others write that there are many Medicaments among Phyſicians, of which there is no Teſtimony of *Galen* extant, among which they reckon *Tereniabin*, which is interpreted Manna.

But a third ſort there is of a contrary Opinion, who affirm it was known to the *Greeks*, but not under the Name of *Manna*, but of *aerial* or *rorid* Honey. And of this (they ſay) *Galen* makes mention in his third Book *de Alimentis*, where he ſaith it was found ſo plentiful in *Aſia* in his Time upon Leaves of Trees, that the Inhabitants cry'd that *Jove* rain'd Honey, from whence it was call'd ἀερόμελι and δροσόμελι, *i. e.* aerial and rorid Honey. Beſides, a long time before *Galen*, one *Amyntas*, a Greek Author, in his Book *de Aſiæ Ponderibus*, exactly deſcribes Manna, under the Name of Aerial Honey, as *Langius* informs us in his ſixty fourth Epiſtle.

(*x*) [*But were ignorant of its Virtues*, &c.]

Some of the Ancients did know Manna, as to its Generation and Subſtance, but not its Qualities and Uſe in Phyſick. *Hippocrates* of *Ulcers*, *Galen*, *de Alimentis*; *Pliny* and *Curtius* make mention of it under the Name of Honey, but its Uſe and Properties were firſt explain'd by *Arabians*; as *Meſues* and *Serapion*, *Hibix* and *Averroes*, *Avicen* and others.

CHAP. VII.

Of Alchymy or Chymiſtry.

(y) *Alchimy* ſignifies Infuſion, the Greek Word *Chymia* denoting as much, and *Al* is an *Arabian* Particle; as *Al Coranus* is as much as *hic Coranus*, and *Al megiſtus Ptolomæus*, is as much as *hic Megiſtus Ptolomæus*, i.e. This greateſt *Ptolomy*.

'Tis a great Queſtion when Chymiſtry was invented, for neither *Pliny* (otherwiſe a diligent Author) (y) nor any other, either Greek or Latin Writer, makes mention of it (z). For my part, I think it to be very ancient, but laid aſide and diſcontinu'd for ſome time afterward. *Suidas* tells us that that Art was in being till the time of the *Argonauts*, when *Jaſon* went to ſteal the Golden Fleece, which was nothing elſe but a Book, that taught how to make Gold of other Metals; for they conceal'd its Name under that of the Golden Fleece, ſo turning the Matter into a Fable.

The *Egyptians* diligently exerciſed this Art in the Time of *Diocleſian*, who hating them for raiſing a Tumult, burnt all their Writings about melting of Gold and Silver, leſt being enrich'd by this Art, they ſhould rebel againſt him, as the ſame *Suidas* informs us. *Diocleſian* was created Emperor in the Year 287, ſo that that Art may be ſaid rather to be *reviv'd*, than to be firſt *invented*.

(*a*) Nevertheleſs there are many Things in this our Age moſt ingeniouſly found out, which were utterly unknown in former Times, among which we may reckon,

1. *Lato*, or *Æs Coronarium*, (gilt Braſs) Braſs brighten'd with a certain Powder, which gives it the Luſtre of a Metal which really it is not; becauſe if a Spoon of this gilt Braſs be thrown into it, it becomes pure Braſs again as it was before, as ſoon as the Powder is conſum'd, and loſeth its acquired and artificial Splendor.

N. B. *By Æs, I think is meant Copper, by* Lato, *or* Æs Coronarium, *Braſs; which is made of Copper, and the Duſt of* Lapis Calaminaris.

2. Chymiſts have found out a way alſo to *whiten Saphires*, ſo that they ſhall ſeem to be Diamonds, and are wont to be ſet ſo artificially into Rings, that no Man whatever (though never ſo ſkilful) can diſcern them to be Saphires. I ſaw an Experiment of this made by ſome *Venetian* Jewellers, by the Order of that Duke, when he was *Prætor* at *Padua*. There was a great Diſpute, and a Wager laid, whether the Stone in ſuch a Ring was a *Saphire* or a *Diamond*. 'Twas concluded to be the latter, and expert Artiſts confeſs'd that that *Saphire* could not be diſtinguiſh'd from a *Diamond*.

3. Chymiſts alſo produce a certain kind of *Tin*, which you would take to be Silver, which retains its Firmneſs, in ſpite of the Strokes of the heavieſt Mallet, but not in that Veſſel call'd *Lacopella*, or *Cupella*. They have beſides many other Inventions; as,

4. *Aquæ fortes*, whereby they ſeparate Braſs from Gold and Silver: A thing which formerly could not be done, according to *Ulpian*, (*Lib.* 5. §. 3. *ff. de Rei vendicatione*) who ſaith, that if Braſs be mingled with Gold, it can never be

ſever'd from it again. Theſe *Aquæ Fortes* do wonderfully affect the Sight in the Separation of Gold and Silver; for the latter ſeems (as it were) to aſcend like a Pillar, and is chang'd into a green, roſy, and other Colours, and is ſo diſpers'd through the Water, that nothing of it appears more, but all is full of that Element, the Gold in the mean time ſinking to the bottom.

5. *Lacopella*, or *Cupella*, is likewiſe a freſh and modern Invention, which is a wonderful *Veſſel*, made of an Ox's Bone, wherein Gold and Silver were poliſh'd and refin'd from all manner of Droſs, ſo that nothing ſhall remain but pure Gold. Thoſe Metals being wrapt up into a thin Leaf of Lead, were caſt into that Veſſel, and ſet over the Fire; and then the *Cupella* ſucking up whatever Metal there is in it beſides, leaves the Gold and Silver entire and untouch'd, which lies at the bottom pure and ſincere, without any Mixture, and this they call *Aurum di Copella*.

It is doubted whether Chymiſtry be *lawful* or not; and truly all the Interpreters both of Civil and Common-Law, are unanimouſly for the *affirmative*; though at firſt look there may ſeem to be ſome Colour of Reaſon to conclude for the *negative*; in regard it is the only Prerogative of the Creator, to change one Subſtance into another; a Thing which no Man (though never ſo famous) can effect. And therefore Satan tempting our Saviour, and making him (as it were) almoſt ready to doubt whether he was the Son of God or not, ſaith unto him, *If thou beeſt*, &c. *command theſe Stones to be made Bread*, *i. e.* Do that which the Almighty alone can effect.

But however, notwithſtanding all this, it is concluded and agreed that *Chymiſtry* is *lawful*, and that upon this Ground, becauſe all Metals proceed from Sulphur and Quick-ſilver (call'd *Mercury* by Chymiſts) which if they have Air, Water and Sun in them, in due and right Proportion, are converted into Gold; but if they are defective in their *Temperament*, and cannot be reduc'd to that exact Perfection, then Silver, Tin or Lead is produced according to the Influence and Diſpoſition of the Elements.

The Art of Man cannot *tranſmute* one Subſtance into another, only Heat and a due Temperament can do this, which have the Virtue and Faculty of changing Quick-ſilver and Sulphur into Gold. But now if this cannot be done, by reaſon of ſome Defect, then the *Chymiſts* do ſupply by Art the Want of that Heat and Temperament, which if they had been natural, would have turn'd the Sulphur into the Subſtance of Gold, which is that which *Chymiſts* do, who ſupply the Defects of *Nature* by the Aſſiſtance of *Art*.

One *Johannes Andræas*, a famous Interpreter of the *Pontificial* Laws, tells us, that one *Arnoldus de Villa Nova* did in the Conſiſtory of *Rome*, in the Preſence of many Cardinals, turn Braſs into Gold, and ſuffer'd it, at his Departure, to undergo the Tryal and Examination of a *Touch-ſtone*,

(*b*) The Art may be true, but I believe ſcarce any Man, or very few, did ever attain to it, or underſtood it; for thoſe that profeſs it, are either very *Simpletons*, or very *Beggars*, it being grown into a (*c*) Proverb [*Who ever knew a rick Chymiſt ?*]

The *COMMENTARY.*

(*y*) [*Alchymy.*]

It appears from ſome Authors, that theſe Words, *Alchymia*, *Chymia*, *Chemia* and *Chimia*, are very ancient, and that they have been in uſe among the *Egyptians* and *Arabians*. 'Tis ſaid in the Text, that (*Al*) is an *Arabian* Particle. *Cælius Rhodoginus* calls it *Archymia*, *quaſi* Ἀργύρου χυμείαν, the *Fuſion* or melting of Silver. Some Moderns give this Account of its Etymology, and tell us 'tis deriv'd ἀπὸ τοῦ ἁλὸς καὶ χέειν, i. e. *Fundere ſalem.* But we muſt not imagine that the Word came from the *Greeks*, though the Greek Tongue was known in *Egypt*, and though there were many Mines of Metal in that Country ; for why ſhould they call that Art, which came not from *Greece*, by a *Greek*, rather than by a *Domeſtick* Name ? So we may ſay *Chymia* is deriv'd, ἀπὸ τοῦ χυμοῦ, *ab Humore & Sapore*, and the like, any way to expreſs its Notion, but not that it comes from that Word as its *Original* ; for it will appear hereafter, that this Art was refin'd and poliſh'd, not by the *Greeks* and *Latins*, but by the *Egyptians*.

The Moderns (whoſe Chief perhaps is *Paracelſus*) call it *Ars Spagyrica*, the *Spagyrical* Art, ἀπὸ τοῦ σπᾶν καὶ ἀργείρειν, *i. e.* to ſeparate and congregate, becauſe by it is extracted a ſubtile and ſpirituous kind of Subſtance, wherein the Efficacy of Medicaments conſiſts, or elſe they call it *Magirica*, or *Extractoria.*

Some call it *Ars Diſtillatoria*, the Art of *Diſtilling* from artificial Diſtillations, which yet *Pan-*

cirollus makes to differ from Chymiſtry, yet ſo as one may ſeem to be deriv'd from the other; and he that is converſant in the *former* (eſpecially of Metals) may be thought almoſt by all to be exerciſed in the latter. Our Author doth not ſo much diſtinguiſh them by their *Subject*, as by their Scope and *End*; for he makes Diſtillation to be a Preparation of a Medicine for a Phyſical Uſe, but Chymiſtry to be the Tranſmutation and *Perfection* of Metals.

(g) [*No Greek or Latin Author mentions it.*]

Thoſe that are very well vers'd in both, tell us, that the very Name of Chymiſtry, *i. e. Chymia*, occurs not there, much leſs the Thing it ſelf. What is quoted out of *Ariſtotle*, makes but little for Tranſmutation; but ſome ſay, that ſomewhat of that Nature may be underſtood from *Hippocrates* and *Plato*, *Heſiod* and *Hermes*.

(z) [*For my part, I think it to be very ancient*, &c.]

We have in holy Writ *Tubal-Cain*, inſtructing every Artificer in Braſs and Iron, whence ſome conceive him to be the firſt Workman in ſome part of that Art, which is call'd *Metallurgick* (ὰ μέταλλον & ἔργον) as if any thing more could be inferr'd from thence, than that he was only ſo far converſant in Metals, as they are neceſſary to *Agriculture*, or Husbandry.

The Art of converting Metals into Gold and Silver, is aſcrib'd to *Hermes Triſmegiſtus*, an *Egyptian*, whom ſome make to be coæval with *Moſes*. But now *Moſes* was born in the Year of the World 2373, that is before Chriſt 1598 Years; and *Diocleſian* the Emperor reign'd about 284 Years after Chriſt; and therefore this Art was in *Egypt* above 1800 Years before *Diocleſian* burnt all the Chymical Books.

In regard *Moſes* was skill'd in all the Wiſdom of the *Egyptians* (*Act.* 7. 22.) and was mighty in Words and Deeds, ſome are ready to conclude that he was not ignorant of this Art, eſpecially if it be true what is affirm'd by ſome, that the *Tabula Smaragdina* of *Hermes*, wherein this Art is expreſs'd, was taken (as all Chymiſts do averr) from *Moſes* his Hiſtory of the Creation. Now if theſe Things are true, who will not affirm with *Pancirollus*, that this Art is very ancient? But it may not be impertinent to ſet down here the Table it ſelf.

" True without a Lye; certain and moſt " true. That which is below, is as that " which is above; and that which is above, " is as that which is below, to do the Mira- " racles of one thing. And as all Things " were from one, by and through the Me- " diation of one; ſo all Things were from " this one Thing by Adoption. The Sun is " its Father, and the Moon its Mother, and " the Wind carry'd it in its Womb. The " Earth is its Nurſe. Its Power, Force and " Efficacy is perfect and entire, if it be con- " verted into Earth. Separate Earth from " Fire, the thin from the thick, and that " ſweetly with much Ingenuity. It aſcends " from Earth to Heaven, and deſcends to the " Earth again, and receives the Energy both " of Superiors and Inferiors.

" And thus thou ſhalt obtain the Glory of " the whole World, and therefore all Ob- " ſcurity ſhall flee from thee. This is the " ſtrong Fortitude of all Fortitude, becauſe " it conquers every ſubtil and thin thing, " and will penetrate every ſolid. So the

" World was created. From hence will ariſe
" ſtrange Adaptations, whoſe Manner is this.
" Therefore I am call'd *Hermes Triſmegiſtus*,
" having three Parts of the Philoſophy of the
" World. 'Tis compleat what I ſaid of the
" Operation of the Sun.

So far the Table, which all Commentators expound in an *Allegorical* Senſe concerning the *Tranſmutation* of Metals; for he all along ſpeaks of an univerſal Medicine, or *Catholicon*, to be prepared out of Vegetables, Minerals and Animals, and to be apply'd both to Soul and Body; ſo that the whole Drift and Deſign of the *Hermetical* Doctrine, is to make a certain general Medicine to cure all Diſeaſes incident to Mankind.

This Art was deliver'd down by *Hermes*, not to the *Greeks* or *Latins*, but to the *Arabians*; ſome ſay that *Triſmegiſtus* wrote of Chymiſtry about the Time of *Moſes*, but ſo obſcurely, that his *Contemporaries* could not, and therefore much leſs the *Latins*, underſtand him. After him ſucceeded *Zoroaſter*, and then *Solomon*, and then the *Arabians*, among whom, no body, before *Geber*, improv'd it. And laſtly *Paracelſus*, and other famous Chymiſts added Perſpicuity of Language and Method to it.

Some think the *Egyptians* conceal'd this Art, and therefore 'tis no wonder it arriv'd ſo ſlowly to the *Greeks* and *Arabians*, though many eminent Philoſophers, as *Democritus* and *Pythagoras*, *Plato* and others, went into *Egypt*, to learn the Secrets of Magick, to which *Phyſiology* is ſo nearly related; for 'tis certain that that Nation did much improve it by that their famous Art, which conſiſted in the Knowledge of Sympathies and Antipathies in natural Things.

(*a*) [*There are many ingenious Things found out in this our Age*, &c.]

Our Author confines not Chymiſtry to *Metals* and *Metallicks*, as may be gather'd from theſe Inventions both Ancient and Modern, which he refers to this Art; as *Chryſo-poeticks*, or making of Gold, *Lato*, or *Gilt-Braſs*, whiting of Saphires, and Preparation of Tin, *Aquæ Fortes*, and *Probatio per Cupellam.* But beſides theſe, there are many more, if not Old, yet New and Modern; you may ſee them in *Libavius* his Alchymy, and in *Bapt. Porta* his Natural Magick.

There are ſome Things ſo much *diſcover'd* and made common by your *Virtuoſos*, that they deſerve no longer to be ſtyl'd Arts. There are others, which are not as yet *invented*; and there is a third ſort which are found out, but known to a very few, or ſcarce to any at all through ſo many Ages; among which there is one chief and principal (the only End and Scope of the whole Art of Chymiſtry) and that ſo wonderfully conceal'd in a deep Silence, that it deſerves to be dubb'd a great *Arcanum.*

1. Firſt, As for thoſe Things that are ſo much diſcover'd, they are *Chymical Inventions*, of which we ſhall mention only the chief, which are partly about, 1. *Metals*, and 2. partly about *Metallicks.*

1. Thoſe about Metals are, 1. The *blending* them together, ſo as ſomewhat ſhall reſult and ariſe from the Mixture; Examples of this are common enough. 2. The *tranſmuting* or changing the one into another, as is frequently done in Iron and Braſs. 3. The

increaſing and diminiſhing their Heavineſs or Weight. 4. The rendring them more firm, compact and ſolid. And 5. The *ſoftning* of ſome, and the hardning of others. All which may be done without any Cheat.

2. Thoſe about *Metallicks* are more ſubtil and curious; as 1. *Gildings*, and 2. *Silverings*, and 3. Various *Separations*, whereby are diſcover'd the wonderful Efficacy and Virtues, the Sympathies and Antipathies of ſeveral Metallicks, as Antimony and Quickſilver, black and white Lead, Sulphur and * *Chryſocolla*: To which we may add the Inventions of Gunpowder and Wire-drawing, and making Glaſs malleable. We omit the Medicinal and Remedial, as Diſtillations and Fumigations, *Suffitus* and Fuſions; all which are very ingenious, and are arrived now to a very great Exactneſs.

* *A kind of Mineral, found like Sand in Veins of Braſs, Silver or Gold. One kind of it is called* Borax, *or Green Earth, which the Goldſmiths ſolder with.*

3. There are other Things, which are not as yet found out, as 1. *Softning* of Glaſs without Fire. 2. The Compoſition of *Electrum*. 3. *Working* curiouſly on the hardeſt Stone. 4. *Excoction* of the thinneſt Waters.

4. There is another ſort of Thing that is found, but known only to a very few. As 1. The making of Glaſs as hard as Diamonds, and 2. The making Metals and Metallicks both a preſent and ſovereign Remedy for deſperate Diſeaſes. 3. The making an *Antidote* moſt exquiſite and certain againſt all manner of Poiſon. And 4. and laſtly (the Crown of all the reſt)

the finding out a way of extracting ſuch pure and ſubtil Spirits, as will improve Metals to the higheſt Perfection, and that without a fallacious or counterfeit Metamorphoſis.

(*b*) [*The Art may be true, but I believe ſcarce any Man*, &c.]

'Tis clear from the Premiſſes, that this Art is *Old* enough, but whether 'tis as true as 'tis *ancient*, i. e. whether it can perform thoſe Things which it promiſeth, is the Queſtion in hand. There cannot be urg'd more cogent Arguments to evince the Truth, than thoſe mentioned by *Pancirollus*, which are taken from Senſe and Reaſon; for 'tis undoubtedly manifeſt by the Teſtimony of the former, that Gold (about which is the great Diſpute) hath been made, and by that Art which *Artiſts* know, and which *Cheats* and *Impoſtors* do only profeſs. And this may be prov'd by many Examples beſides that (which our Author mentions) of *Joh. Andræas*. He that is deſirous of more, may fetch them from ſeveral Artiſts, as *Geber*, and *Hermes*, and many others.

Corn. Agrippa in his firſt Book, and fourteenth Chapter of Occult Philoſophy, tells us, that by the *Spirit*, or rather *Form*, or purer Part of Gold, imperfect Metals and Mercury may be converted into Silver, and that he ſaw it done, and knows it to be done. Chymical Books are full of Inſtances of this Nature. *Cardan* ſaith in his ſixth Book of Subtilties, that Quick-ſilver was turned into Gold before the Duke and Senate of *Venice*, by an Apothecary of *Tarviſo*.

Beſides, why ſhould ſo many famous Men of ſeveral Nations write ſo many Volumes, and thoſe excellent Books of this Art? Did they *increaſing* and diminiſhing their Heavineſs or Weight. 4. The rendring them more firm, compact and ſolid. And 5. The *ſoftning* of ſome, and the hardning of others. All which may be done without any Cheat.

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the finding out a way of extracting ſuch pure and ſubtil Spirits, as will improve Metals to the higheſt Perfection, and that without a fallacious or counterfeit Metamorphoſis.

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Beſides, why ſhould ſo many famous Men of ſeveral Nations write ſo many Volumes; and thoſe excellent Books of this Art? Did they ſeek for *Applauſe* and Glory from Poſterity in Toys and Trifles? *Egyptians* and *Arabians*, *Chaldæans* and *Germans*, *Spaniards* and *Engliſh*, &c. have all treated on this Argument. Who can number the Authors that have handled this Subject? We ſhall mention ſome, and thoſe the moſt choice ones, in an alphabetical Order.

1. *Arnoldus Villa-Novan.*
2. *Agatho-Dæmon.*
3. *Apuleius.*
4. *Africanus.*
5. *Auguſtin Panthes.*
6. *Canides.*
7. *Chales.*
8. *Calides.*
9. *Comerius.*
10. *Chryſorichius.*
11. *Democritus.*
12. *Geber.*
13. *Hermes.*
14. *Heliodor. ad Theodoſ.*
15. *Lullius.*
16. *Merlin.*
17. *Oſthanes.*
18. *Olympiador. Alex.*
19. *Orus.*
20. *Pebichius.*
21. *Petaſius.*
22. *Pelagius.*
23. *Roſin. Alexand.*
24. *Rhodianus.*
25. *Syneſius.*
26. *Stephan. ad Heracl.*
27. *Veradianus.*

To which Liſt, if we ſhould add the Modern Writers (Good God!) what a Crowd of Witneſſes would here be? In Courts of Judicature, in Matters relating to Mens Lives and Eſtates, their Fame and good Name, we give Credit to the Teſtimony of two or three: Then why ſhould we be ſo hard to believe great Clerks, Men eminent for Letters, by reaſon of a few frivolous Exceptions and Arguments, which have been often anſwer'd already in general, by *Geber* and *Ventura*, and *Pedro Bono* of *Ferrara*, and others; but more particularly by *Quercetan*, who hath learnedly confuted *Aubertus*, and by

Maſſet, *Severinus*, *Rubeus*, and *Penotus*, who have anſwer'd *Eraſtus*, and by *Libavius*, who hath baffled them all in his *Syrraxi Metallicà*. They all agree that 'tis not abſurd or irrational, to allow and grant ſuch a *Tranſmutation* as we ſpeak of; for the Confirmation whereof, they produce infinite Proof, too tedious to be mention'd or ſet down here.

But admit 'tis probable (not to ſay without doubt) from what hath been ſaid, that this Art is certain, yet 'tis not Prudence to commit our ſelves to this impetuous Sea: For obſerve the Sentiments of our Author on the Matter, who ſuggeſts unto us, that the Art is ſcarce underſtood by any, and hath reduc'd many to Rags and Beggary. There are Difficulties occur in the Scholar or Learner, in the Maſter or Teacher, and in the Operation and Practice.

1. As for the *Scholar* or *Learner*, he muſt be virtuous and pious, and an earneſt Supplicant for this Gift to Heaven; he muſt be prudent and learn'd, a Linguiſt and a Philoſopher, well ſeen and vers'd in the Principles of Nature. He muſt be laborious and patient, clear of all Troubles, disbanding all Cares; as free from Paſſion as tenacious of Secrets, neither prodigal nor covetous, competently rich both in Money and Books; very ſtudious and reſerv'd, full of deep Contemplations, and hugely wary of Diabolical Deluſions. In a Word, he muſt be well endow'd with Goods of Body, Soul and Fortune.

2. As for the *Maſters* and *Teachers*, there are Difficulties to be met with in relation to them too. *i. e.* The Books of this Art are very hard to be underſtood, for this kind of Knowledge

either lies ſcatter'd here and there in them, or elſe 'tis wrapt up in Riddles and Allegories, in Similitudes and Emblems, and thoſe either taken from, 1. *Elementary* Beings, as Men and Animals, Vegetables and Minerals; or elſe, 2. From the *Elements* themſelves, from Diſſimilitudes and Equivocations, and ſtrange Contradictions; from unuſual Names, odd Characters, and Tranſpoſition of Letters, from corrupt Tranſcriptions, and variety of Style.

3. The third Difficulty is in *Operation* and *Practice*, and that in reſpect of the *Matter*, which is to be aſſum'd as the Foundation; and alſo in reſpect of the *Management* of that Matter, which ought to be done with fit Inſtruments. I ſay, whether we conſider either of theſe, incredible Obſcurity and Perplexity will every where ariſe.

Theſe, theſe, and not the *Uncertainty* (as is ſuppos'd) of this Art, are the true Cauſe why ſo many of its Votaries loſe their Labour, their Sweat and their Pains, yea, and make Shipwreck of their Health, their Wealth, and their Fame too; ſo that they find in themſelves that wonderful *Metamorphoſis* which they are not able to produce in *Metals*; and whilſt they reach after that which they cannot *catch*, they loſe in the *Interim* what before they *poſſeſs'd*.

(*c*) [*A common Proverb, I never ſaw a wealthy Chymiſt*, &c.]

There is nothing to be expected from Chymiſtry (if we believe ſome) but Smoke and Aſhes, Sighs and Sweat, Impoſture and Ignominy, it being an Art (as they ſay) that never advanc'd a Man to Wealth and Honour, but hath plung'd hundreds into an Abyſs of *Poverty*. It is very ob-

obſervable, that ſome Men, otherwiſe prudent and diſcreet enough, have been charm'd with this Folly of *dabling* in Chymiſtry; and others in plight and very good liking, have *jaded* themſelves in purſuit of this Vanity, and whilſt they have endeavour'd to *plump* up their Fortunes by the help of this Art, they have made them lank and meagre by this fruitleſs Study.

Chymiſts promiſe *Mountains* and mighty Things to others, but can ſcarce produce *Mice* to themſelves; let them drive away *Want* from their own Doors, before they fright and chaſe away the *Goblin* from the Threſhold of others. They are generally reputed a *begging* Crew, born like Muſicians under a *Three Penny* Planet; and though they confeſs themſelves to be poor and indigent, yet will they pretend to enrich others, as if their Neighbour's Neceſſity was more pungent to them than their own Beggary.

Chymiſtry is wonderful pleaſant, for the Tryal of ſo many rare *Concluſions* it carries with it; but it is very *coſtly*, and an enchanting kind of Art, which hath melted in *Crucibles* many a fair Lordſhip, and turn'd many a Mannor into Smoke and Aſhes. One preſented *Sixtus Quintus* with a Book of Chymiſtry, and his Holineſs gave him an empty Purſe for a Reward; as good an *Emblem* of the Vanity of that Science, as it was a *Specimen* of Popiſh Wit.

CHAP. VIII.

Of Diſtillations.

(*d*) THE Art of *Diſtilling* was found out after the Conſtitution of the *Roman* Empire. 'Tis probable 'twas invented in the very Practice and Operations of Chymiſtry.

(*e*) Some ſay that a certain *Phyſician* having a Meſs of *Coleworts* upon the Table before him, and being ſuddenly ſent for to viſit a Patient, he covered at his Departure, his Diſh with another, and found it at his Return bedew'd with Moiſture. And obſerving from hence, that the Extraction of *Humidity* was very eaſy, he bent his Study ſo far that way, as to give *Being* to the Art of Diſtillation. Others by following his Example, have ſo improv'd it, as to bring it to Perfection.

(*f*) 'Tis an Art that is very *beneficial*, being the happy Parent of *Aquæ Vitæ*, of Oil of Cinnamon, and of ſeveral other uſeful Liquors, and of many wonderful Effects. All thoſe Waters of Succory and Capers, and of other Herbs, which were given as Medicines to ſick Perſons, are now *diſtill'd*, which were formerly wont to be *ſodden* or boil'd.

The COMMENTARY.

(*d*) Diſtillation is taken for that part of Chymiſtry, whereby elevated Fumes, Vapours and Steams are reſolv'd into Waters, Oils, and the like. The uſe whereof is very frequent in Phyſick.

(*d*) [*Invented after the Conſtitution of the* Roman *Empire*, &c.]

As for the Antiquity of this Art, ſome hold it, that it was in being about 600 Years ago, in regard *Rhaſis* and *Albuchaſis*, two famous Phyſicians, about the Year of our Lord 1080. make mention of it: But others would have it to be much older, and that upon the Account of a little *Cheſt* found in the *Ateſtine* Field near *Padua*, wherein the Elements by *Maximus Olybius* were devoted as a Preſent to *Pluto*. But becauſe we know not, but that that may be a *Fiction*, invented by ſome Body who had a Mind by thoſe Veſſels in the Cheſt to bring credit to this Art; and becauſe we are uncertain, whether that was done by Diſtillation or ſome other way, we do not much embrace it, nor wholly reject it; though the Verſes inſcrib'd upon it, do ſavour ſomewhat of Antiquity.

Plutoni ſacrum munus ne attingite Fures,
Ignotum eſt vobis hoc quod in Orbe latet.
Namque elementa gravi clauſit digeſta labore
Vaſe ſub hoc modico maximus Olybius.
Adſit fœcundo Cuſtos ſibi copia Cornu
Ne pretium tanti depereat laticis.

That is,

" This ſacred Gift to *Pluto*, I forbid
" You Thieves to touch (for 'tis a Secret hid)
" With Art and Pains hath great *Olybius* pent
" In this ſmall Urn, the unruly Element.

This Urn contain'd a leſs within it wherein were included two Phials moſt curiouſly wrought, the one of Silver, and the other of Gold, both full of moſt exquiſite Liquor, which fed a burning Lamp for many Ages. The Urns were inſcrib'd with the following Poetry.

Abite hinc peſſimi fures!
Vos quid vultis veſtris cum oculis emiſſitiis.
Abite hinc veſtro cum Mercurio petaſato caduceatoque
Maximus maximo donum Plutoni hoc ſacrum facit.

That is,

" Be gone ye Thieves, why ſtand ye here to pry,
" Depart from hence with your God *Mercury*,
" Devoted to great *Pluto* in this Pitcher
" Lies here a Gift, the World ſcarce knows a richer.

Some affirm, that both *Greeks* and *Arabians* knew the Uſe of diſtill'd Liquors, becauſe *Actuarius*, though one almoſt of the laſt of the *Greeks*, yet firſt made mention of Roſe-Water in theſe Words: *let a Pound of diſtill'd Juice, or Liquor of Roſes (call'd* Rhodo-Stagma) *be made warm with Sugar*, &c.] Among the *Arabians*, *Meſues* (who flouriſh'd in the Year 1160.) firſt mention'd a Sublimation of Wormwood-Water and Roſe-Water. Others think this Art was known to *Hippocrates*, *Ariſtotle* and *Galen*.

(*e*) [*Some ſay that a certain Phyſician cover'd his Diſh of Cole-worts*, &c.]

As for the Original of this Art Experience tells that it was firſt hinted and occaſioned by the Courſe of Nature; for Clouds, Rains, and Winds are made in the great World, and Catarrhs in the leſs by Nature, *j*uſt as Diſtillations are made by Art. Nothing is more commonly known than this in a Kitchin; but it ſeems, *Pancirollus* had rather fetch it from that accidental Inſtance mention'd by him.

(*f*) [*'Tis a very profitable Art that furniſheth us with* Aqua-Vitæ, Oil of Cinnamon, &c.]

By the help of this Art we can extract from Animals and Plants ſeveral kinds of Subſtances, As 1. *Water*, and that in greater Quantities if the Shrub be green, and leſs if wither'd. 2. *Oil*, not that fat and ſordid Subſtance, that is ſqueez'd from Almonds and moſt Seeds, but a more refin'd Iſſue of a better Art, which will not grow rancid, putrify, and corrupt with Time. By Virtue of this we can ſever from any Body thoſe four *Principles* of all Things, which Nature hath blended together at their firſt Original, *viz. Water* in a condenſed Vapour, *Air* in a white Oil, *Fire* in a red Oil, *Earth* in Dregs.

By Virtue of this Art, we ſublimate *groſſer* Bodies into *thinner* Spirits, and by it we condenſe airy Spirits into *thick* Bodies. By this Art we extract the purer and ſubtiller Virtues of Minerals, and Plants, Stones and Jewels, *&c.* and that without the *fæculency* of impure Matter, and do *enoble* them and advance them into an higher Temper.

'Tis the *Property* of Nature to produce Things, and to endow them with Virtues, but 'tis the *Trick* of Art, when they are produced, to exalt and enrich them. A Diſtiller can extract Oils and Eſſences, Elixirs and Tinctures, Salts, *&c.* He can ſhatter a Compound into its firſt *Principles*, and can render them ſingly more pure and defæcate. He can ſeparate their different Faculties, Powers, and Qualities, ſo as to uſe them according to his Pleaſure.

You may find many Things relating to this Art not only in *Baptiſta Porta*, but in many

Moderns alſo; as *Geſner and Quercetan*, *Scuerinus* and *Wekerus*, *Langius* and *Lullius*, *Libavius* and *Plaſſet*, *Dornæus* and *Paracelſus*; all which did not only extract Waters and Oils, but Eſſences and Tinctures, Salts and Elixirs, *Magiſteriums* and the like.

Diſtillation is alſo as *pleaſant* as profitable, it being delightful to behold the Miracles of this Art ſporting with Nature; whilſt the diſtilling Vapours (even of the dryeſt Things) do preſent us with the proſpect of a *variegated* Scene, and ſhew us a *Landskip* (as it were) of Party-coloured Fields. Sometimes you may ſee an humble Plain, diffuſing it ſelf into a great Breadth, and ſometimes you may ſee an ambitious Mountain riſing and ſwelling into a vaſt Height. Here you may behold the tranſparent Brooks and Cryſtal Rivers, there you may contemplate the flowing of Streams, and *Bubblings* of Fountains, and anon have a Proſpect of Trees and Fruits.

CHAP. IX.

Of Bells.

(g) BELLS were invented about the Year of our Lord 400, by *Paulinus* Biſhop of *Nola*, a Town in *Campania*, famous for the Death of *Auguſtus*. They are call'd *Campanæ*, becauſe found out firſt in *Campania*, and alſo *Nolæ*, from the Place where they were firſt made.

They are of very great Uſe, in regard they give us at a Diſtance the Hour of the Day or Night, when we cannot ſee the Sun. They call us to Prayers, and alarm us to aſſiſt at a Conflagration. They aſſemble the Magiſtracy, when there is a Summons to Arms. They call Scholars to their Books, and the Judges to the Bench. In a Word, they are Signals that give Notice of all Publick Actions, ſo that we ſhould be very much incommoded, and at a Loſs without them.

The *COMMENTARY.*

(*g*) [*Invented by* Paulinus *Biſhop of* Nola,&c.]

Bells came firſt from the *Hebrews*, where the High-Prieſt had in the Skirt of his uppermoſt Veſtment little Bells to ring, when he was in the Holy Place within the Veil: Therefore, methinks 'tis a Vulgar Error to imagine, that *Paulinus* a Man equal to St. *Jerome*, and a Perſon of celebrated Sanctity, was the firſt Author of Bells, as if they were not known in former Ages. It is rather more probable, that he chang'd the Uſe of them to Religious Purpoſes; for their great Antiquity is well ſhew'd by *Adrian Junius* in his *Arumadverſ. lib.* 3. *cap.* 11. who tells us out of the Ancient Scholiaſt upon *Theocritus*, that they were to be rung at Funerals, or at the Death of Mortals, becauſe they fancied that Ghoſts and Spectres, were put to flight at their Sound. *Tibullus* ſeems to intimate, that magical Enchantments were hinder'd by Bells, when he ſings thus:

Cantus & e Curru Lunam deducere tentat,
Et faceret ſi non æra repulſa ſonent.

i. e.

" They would charm down the Moon, but that
" their Spells
" Are hindred by the Noiſe of ſounding Bells.

For they ſuppoſed that the tinkling of Braſs or Metals hinder'd the ſound of magical Verſes from aſcending to the Moon, and that by this Means ſhe was aſſiſted in her Labour. Hence came the Cuſtom of ringing of Bells, as oft as it Thunders, for their Comploſion and Beating of the Air, is thought to be a Means of diſperſing that Meteor.

Strabo likewiſe tells us in his 15th Book, that the *Perſians* call'd an Aſſembly before Day-light by the ſound of a Bell; ψόφα χαλκοῦ πρὸ ὄρθρου. We may remember alſo *Aaron*'s Bells, and ſee further in *Cæl. Rodogin. Lect. Antiq. lib.* 19. *cap.* 11. copiouſly and at large. Concerning the Matter or Subſtance of which, we may obſerve that *Durantus* (*de Ritibus Eccleſ. Cathol. lib.* 1. *cap.* 22.) ſaith of the Citizens of *Caſarea*, that upon a joyful Occaſion, they went about *Ligna ſacra pulſantes*, whereby he means that they had ſome hollow Veſſels of Wood, which they uſed inſtead of Bells. Some ſay, that in the Country of *Preſter John* they have Bells of Stone.

As we have Bells in our Churches, ſo had the Pagans in theirs. The Emperor *Octav. Auguſtus* was the firſt, who in the higheſt Place of the Temple of *Jupiter Capitolinus* hung Bells. And at the ringing of them, the Heathens (as was ſaid before) were wont to meet at their Aſſemblies as at Baths.

The *Laconians* were wont at the Death of their King, to tinkle a Caldron inſtead of a Bell. The *Jews* had Minſtrels, as may be ſeen in the 9th of St. *Matthew*: For at the raiſing to Life *Jairus* his Daughter, the Men of Muſick were commanded to troop off. We read that the

Prieſt of *Proſerpina* was wont to ring a Bell at *Athens*, and ſo did they of the *Moſaick* Oeconomy, *Exod.* 20. 34. in their Pontifical Veſtments. The Prieſt had a Bell and a Pomegranate upon the Hem of the Robe round about, that the Sound might be heard at his ingreſs and egreſs from the Holy Place. It did import and ſignify that he was to be Vocal, not in calumniating, but in teaching and exhorting, in reproving and comforting, *&c.* Hence a Bell was an *Hieroglyphick* of Predication or Inſtruction

Suidas tells us, That Watchmen carried Bells about them in the Night, and that Anſwers were given preſently at their Sound. And the ſame Author ſaith, that they were wont to try generous Horſes by the Noiſe of Bells, whether timerous or bold, and Proof againſt the Clamour and Tumult of a Battle.

The *Romans* were called at ſet Times to and from the Bath by the Sound of a Bell, according to that of *Martial*.

Redde Pilam, ſonat as Thermarum; ludere pergis?
Virgine vis ſolâ lotus abire Domum?

He adviſeth him, if they would waſh, to do it quickly for the Bell rings, and by-and-by there would be no bathing but in cold Water. They were therefore call'd by a Bell to the Bath, which was e're long to be ſhut.

The *Græcians* in their Fiſh-Market, a little before Supper rung a Bell, as *Plutarch*, informs us in the 14th Book of his *Sympoſiacks*, where he obſerves, that they are not call'd Gluttons and Gormondizers who are Devourers of Fleſh, as *Hercules*, or of Figs, as *Plato*, or of Grapes, as *Arceſilaus*; but thoſe who eat in the Fiſh-

Market, and idly ſantring about the Stalls there, do preſently here the Sound of that Bell.

There is a pleaſant Story to this Purpoſe in *Strabo*, which is this: " While a certain Fidler was entertaining the Mob with a Specimen " of his Art, it ſo happened that the Fiſh-" Market Bell rung; upon the Sound whereof, " all the People fled to their Piſcary Negotia-" tions and left Crowdero alone, except one " who was very deaf. The Fidler obſerving it, " came to the honeſt Man, and thank'd him " for his Civility and the great Reſpect he " ſhew'd to Muſick, in not leaving him (like " the reſt) at the Sound of the Bell. What, " ſaith the deaf Man, hath the Bell rung? I " marry hath it. Then God be with ye, " (Mr. Fidler) quoth he, and away he ſcamper'd " and ſhew'd the Man of Mirth a fair Pair of " Heels.

Ringing of Bells was firſt ordain'd by *Sabinianus*, that the People might be aſſembled together to hear Divine Service at a certain Hour of the Day. A fuller Account of the ancient uſe of Bells may be found in *Hierom. Magius*'s Book upon that Subject, *De Tintinnabulis*.

CHAP. X.

Of Clocks.

AFTER the Invention of Bells came the Uſe of Clocks, the Manner of making which we read in *Vitruvius*, who tells us how a Chariot may be made, which ſhews how many Miles are diſpatch'd in an Hour, in which Chariots the ſame Wheels are contriv'd as are uſed in Clocks, only inſtead of the Pebble-Stone, which dropt hourly into the Baſon, there is now (*h*) an Hammer; which ſtriking on a Bell, tells the Number of the Hours.

Some make the Pictures of Angels moving from their Places to ſtrike the Bell, and to do Homage in their Way to the *Virgin Mary*. Others have invented other kind of Faſhions. (*i*) They are now a-days made with ſuch Art and Curioſity, that they will rouze a Man up at what Hour he will; and they are made in ſuch a Manner, as that they may without any Weight be laid upon a Table, or may (like an Almond) be hung about the Neck.

Some repreſent the *Phaſes* and Appearances of the Moon in the (*k*) Heavens. But that is not all, there are other Inſtances of humane Ingenuity in this Particular; for I ſaw one in the Hands of the Reverend Seignior *Delphino*, which had Circles about its Dial-plate, repreſenting and ſhewing the Eclipſe of the Sun; which in moving through them, was in the ſame Sign in them as he was in the Heavens. He ſet at Night, and roſe in the Morning in the ſame Point of the Horizon there as he did in the Sky.

The Moon alſo was ſometimes at a *Diſtance* from the Sun, and ſometimes (as 'tis in the World) in Conjunction with it. I am told, there was a Watch preſented by one of *Cremona* to *Charles* V. which contained the whole Frame and Machine of the Heavens, together with all the Stars of the Firmament and Signs alſo, which were wheeled about juſt as they are in their celeſtial Orbs; ſo that the Heavens ſeem to be brought down to the Earth. It cannot be denied, but that the Invention is rare and excellent, and worth our Obſervation.

The COMMENTARY.

(*h*) [*An Hammer ſtriking the Bell tells the Number of the Hours*, &c.]

The Ancients formerly meaſured their Time by *Clepſydra* (of which in the former Book) juſt as we do now by Hour-Glaſſes, bnt not ſo well and conveniently, in regard Water is rarified by Motion, ſo that they could not exactly compute the Time. The Ancients had alſo *Sun-Dials*, which declared the Hours by the Shadow of the Hand, the Invention of which is aſcrib'd to *Anaximenes* a *Mileſian* by *Pliny*. It was a a good while e're they were uſed at *Rome*: But in the twelve Tables there was only rehearſed the riſing and ſetting of the Sun, and a few
Long. Years after Noon or Mid-Day was found out. And this was only on clear Days, when they might perceive the Courſe and Altitude of the Sun. The firſt Dial was ſet upon a Pillar openly, which ſtood behind the common Pulpit or *Roſtra*, at the Charge of *Valerius Meſſala* then Conſul in the firſt Punick War. There was a famous one in *Mars* his Field, from an Obelisk erected and golden Figures placed horizontally about it, and the Surface of the Ground whereon it ſtood was pav'd with Square-Stone; it had the four Winds in the four Corners with this Inſcription [*ut Boreas ſpirat*] and all of Moſaick Work; it was brought out of *Egypt* by *Auguſtus*, and is deſcribed by *Jacobus Laurus*.

(*i*) [*They are now a-days made with ſuch Art and Curioſities*, &c.]

Our Author mentions here the ſeveral Forms and Faſhions of Watches, which indeed are ſo various, that it would be a tedious Piece of Work to reckon up all of them. But when he tells us that the Motions of the Celeſtial Spheres are expreſs'd in ſome, he put us in Mind of *Archimedes* his Invention, who made an Heaven of Braſs, repreſenting the Planets, and all the Movements of the natural Clock-work of the ſupernal Orbs. And (without doubt) ſuch was that Sphere of *Silver* preſented to *Solyman* the Great *Turk*, together with a Book by the Artificer how to keep it in Motion, and alſo that other made of Glaſs, wherein *Sapor* the *Perſian* King ſitting on his Throne, did (like an upſtart Deity) contemplate under his Feet that exquiſite Machine.

Who doth not perceive how humane Ingenuity copies in many Thing, even *Divinity* it ſelf? *Zeuxis* his Pencil put a Fallacy on the Birds, and drew ſo lively the Deformities of an old Woman, that the Painter almoſt burſt with Laughter at the Sight of the Picture. Why ſhould I tell you of *Myro*'s Heifer, ſo lively ſhap'd in a Figure of Braſs, that it impos'd not only on the Herd alone, but cozen'd and cheated the Herdſmen too. What need I mention the Marble *Venus*, ſo curiouſly wrought; nay, rather begotten by *Praxiteles*, that it mov'd the Blood of the Beholders, and had as many Lovers as it had Spectators.

(*k*) [*But this is not all, there are other Inſtances of Humane Ingenuity*, &c.]

For ſome write, that the *Egyptians* through the ineffable Power of the Gods, framed ſome Images which ſpake articulately and mov'd too; and we read that *Albertus* made an Head of Earth, which at Times was vocal. *Baptiſta Porta* tells us how it may be done with a Pipe of Lead; ſo that we ſtand not ſo much amaz'd at *Architas* his flying Pigeon that was made of Wood.

(*l*) [*May hang* (*like an Almond*) *about the* Neck, &c]

Let us ſtand and admire here thoſe little and minute Pieces of Art, which by reaſon of their exquiſite and extreme Exility, do almoſt fly the Sight. *Callicrates* made a Piſmire of Ivory, and other little Animals in ſo ſmall a Volume, that their Limbs and Parts were hardly legible. And *Myrmicides* the *Mileſian*, among other Monuments of his ſingular Ingenuity, made ſuch a Pigmy-Chariot, as that a Fly could cover it with one ſingle Wing. There was ſeen at *Mecklin* fifteen Pair of Dice (their Spots diſtinguiſhable) in the Womb of a Cherry-Stone.

The *Iliads* in a Nut ſhell, and the *Lord's-Prayer* in a Single Penny, and *David's Pſalms* in the Hair of King *Charles* I. his Brazen Figure in St. *John*'s *College* Library in *Oxford*. I ſay, theſe Curioſities are the *Brachigraphy* or Short-hand of Art, and the Authors of them muſt be excellent *Sheltons*,

CHAP. X.

Of the Mariners-Compaſs

(m) NEither leſs profitable and advantageous is the Uſe of the *(n)* Magnet, which always inclines and tends to the North; ſo that in a cloudy Day, or a dark Night, nay in a Storm or Tempeſt, you may know by this *Pixis* where you are; which is an *(o)* admirable Art, and very eaſy to thoſe that underſtand it.

(p) 'Twas found out at *Almaſi* a City of *Campania*, now called *Terra di Lavoro*, according to *Blundus* in his *View of Italy*. *(q)* The Inventor of it is not known. The Ancients ſailed by the Pole Star, which they call *Cynoſura*, and alſo by other Stars, as *Virgil* ſhews in his fifth Book.

-------Clavumque affixus & hærens
Nuſquam amittebat, oculoſque ſub aſtra tenebat.

------ " His faſten'd Hands the Rudder keep,
" And, fix'd on Heav'n, his Eyes repel invading
" Sleep.

If the Heavens were dark and gloomy, they knew not where they were, but quite loſt in a Manner according to that of the forecited Poet, *lib.* 3.

Tres adeo incertos cæca caligine ſoles
Erramus pelago; totidem ſine ſydere noctes.

" Three Starleſs Nights the doubtful Navy ſtrays
" Without Diſtinction; and three Sunleſs Days.

But now Mariners guided by Experience, gain'd by Obſervation of the North and of the

Compaſs, do always know where-abouts they are.

The COMMENTARY.

(*m*) [*Neither leſs profitable is the Magnet*, &c.]

By the Help of the *Pixis* Men encompaſs the World, and by frequent Navigations do put (as it were) a Girdle about the earthly Globe. By Virtue of this, Merchandize is improv'd and becomes gainful, Converſe is enlarg'd, and Men have Commerce and live in the Republick of the Univerſe as in one City.

(*n*) [*Magnet.*]

'Tis ſometimes call'd *Acus*, a Needle, *Acicula Marina*, and ſometimes a Magnet, *Acus Navicularia Pixis*, and *Pixedula Nautica*.

(*o*) [*'Tis an admirable Art*, &c.]

'Tis certainly moſt worthy of our Wonder above all Inventions, whereby ſo many Seas are eaſily plow'd, and upon whoſe Account alone, the ſafety of ſo many thouſands of Men is committed to the Depth of the Ocean, to the vaſtneſs of its Waters, and the impetuoſity of the Winds. 'Tis ſtrange! that Sums of Money; nay, that the Lives of Princes ſhould be committed and truſted to ſo ſmall a Veſſel, and to ſo little a Needle.

The Compaſs is an Horizontal Diviſion of the thirty-two Winds, upon a round Piece of Paſte-Board ſet in a Box; in the Centre whereof upon a Pin of *Latton cinque* bor'd, the Needles or Wires firſt touch'd with the Stone, are placed. This Box hangs in another Box between two Hoops of *Latton*, that however the outward Box is toſſed up and down by the Motion of the Ship, yet the innermoſt may always hang level to the Horizon. It is placed in the middle of the Poop, upon a right Line in a Gind, to paſs by the Main-Maſt through the Centre of the Ship, and ſo puts the Pilot in his Way.

(*p*) [*'Twas found out at* Amalfi, &c.]

A Town in *Naples* about 300 Years ago, by one *Flavius* as the general Report is: But we find many Authors (of good Credit) that are of another Opinion. Dr. *Gilbert* our Countryman (*De Magnete*) ſeems to aſſert, that *Paulus Venetus* brought the Uſe of the Compaſs from the *Chineſe.* And *Paulus Oſorius* (of the Acts of King *Emanuel*) aſcribes it to *Gama* and his Countrymen the *Portugueze*, who, as he pretends, took it from certain barbarous Pyrates roving about the *Cape of Good Hope.* But *Goropius Becanus* thinks his Countrymen the *Germans* have a title to the Invention, becauſe the 32 Points of the Winds borrow the Name from the *Dutch* in all Languages: But *Blondus*, follow'd by *Pancirollus*, (both *Italians*) will not have their Country loſe the Praiſe thereof.

(*q*) [*The Inventor is not known*, &c.]

Moſt ſuppoſe *Flavius* to be the Author of it, tho' ſome aſcribe the Invention to the Citizens of *Amalfi*, who in the Year 1300. had the Virtue of this Magnetick Needle from one of their Town called *John Goia.* Others aſcribe it to one *Vaſco de Gama*, a *Portugueze*, the firſt Diſcoverer of the *Eaſt Indies* in the Year of our Lord 1497. and a third ſort of People think that this Inſtrument was brought out of *China*, by one *Marcus Paulus* a *Venetian* in the Year 1260. Whoever he was that was the firſt Diſcoverer of this noble Invention, 'tis pity he ſhould lie hid in ſo neglected an Obſcurity; and that ſo great a Benefactor to the World, ſhould want a *Lapidary*, when the Diſturbers of it have ſo precious a *Memory*. And this unknown Fellow (if it was *Flavius*) hath deſerv'd more than ten thouſand *Alexanders*, and as many *Ariſtotles*. And this ſingle Art hath improv'd Knowledge, and done more good to the World, than all the Niceties of the ſubtle Schools.

CHAP. XII.

Of Printing.

(*r*) THE Invention of Printing alſo is worth our Notice and Obſervation, which was found out in *Germany* in the Year 1440. 'Tis reported, that one ſailing through the (*ſ*) *German* or *Baltick* Ocean, happen'd to be carried into *China*, formerly called the Country of the *Seres*, where he (*ſ*) obſerv'd the Art of Printing to be in Uſe.

And therefore having ſeen their Characters and their Forms, and curiouſly obſerved them, after his Return into *Germany*, he improv'd and perfected the like Art of *Calcography*. An Art very uſeful and beneficial, in regard all Things before were fain to be written, and there were ſeveral Shops built on Purpoſe for that very Uſe. A Thing very laborious and chargeable, eſpecially to thoſe that bought Books. I ſaw ſome few Pages printed at *China*, tho' it is not ſaid or recorded that *Typography* was ever there.

The

The COMMENTARY.

(*r*) [*The Invention of Printing is worth our Notice*, &c.]

This rare Art is inferior to none, whether we conſider the Dignity, Utility, or Curioſity of it. The *Munificence* of Nature ſeems to be quite exhauſted and wholly conquered by ſo noble an Invention, which equals the greateſt Miracle of Life, and cannot be parallel'd by the nine *Muſes*, to every one of whom Antiquity aſcrib'd ſome Art or Science.

Printing is an excellent Gift beſtow'd on the World in the Dotage of Nature, for the Improvement of Humane and Divine Learning, by bringing to Light the Authentick *Manuſcripts* of knowing Men. If it be commendable to tranſmit to Poſterity the Inventions of others, the Product and Iſſue of their Sweat and Labour, Ingenuity and Study, leſt devouring Time and envious Oblivion (thoſe *Banditti* and *Pyrates* of Memory and Science) ſhould deprive ſucceeding Ages of the Knowledge of them; I ſay, if 'tis Praiſe-worthy to do this, Then what large Encomiums doth *Typography* merit, whereby glorious *Atchievements*, and renowned *Arts*, ingenious *Conceptions* and ſublime *Speculations* are eternally regiſtred? All which had periſh'd for ever in Oblivion, if not reſcued from the Grave and conſecrated to Immortality by the Help of this Art. If exquiſite *Inventions* have ſo honour'd Mankind, as to enrol Mortality among the *Divinities* of the Gods; then with what Titles of Dignity ought *Germany* to be enobled, whoſe Sagacity and Induſtry hath enrich'd the World with ſo rare a Piece of Skill?

This rare Art and exquiſite Myſtery hath preſerv'd from Corruption the choiceſt Authors, and hath diſcover'd to the World the noble Atchievements and Acts of all Nations. It reſtores the Memory of hoary Antiquity, and keeps from being loſt the Divine Wiſdom of the ancient Philoſophers. Many written Copies that for many Ages had been buried in Obſcurity, by this excellent Invention have been brought to light, and to enjoy *Immortality.* Typography in its Infancy was in great Admiration, and is as beneficial and profitable, as ſurprizing and marvellous; and had been more wonderful, if it had not been ſo common. It was firſt undertaken with more Boldneſs and Confidence, than Aſſurance or Certainty: But now by the Aſſiſtance of humane Wit, 'tis arriv'd to that Perfection wherewith it is crown'd.

[*An Art very uſeful and beneficial.*]

In ſaving vaſt Charges which Men were at in copying of Books; in regard one Printer (they ſay) can print as much in one Day, as the ſwifteſt Scrivener, or the readieſt Pen can write in a whole Year.

(*ſ*) [*Which was found out in* Germany, &c.]

All Authors do unanimouſly aſcribe this Invention to one of that Nation; and 'tis ſaid that *Tully's Offices*, was the firſt Book that was printed, and that by one *John Fauſtus* at *Mentz*: For in the *Bibliotheca Auguſtana*, there is this Inſcription,

> *Præſens M. Tullii clariſſimum opus Johan. Fu*
> *Moguntinus Civis, non atramento, plum*
> *Canna, neque cerea, ſed arte quadam perp*
> *chra manu Petri de Gernſheim Pueri m*
> *feliciter effeci. Finitum Anno* 1466. D
> 4 Feb.

That is,

"I *John Fuſt* Citizen of *Mentz*, have hap-
"pily compoſed this preſent excellent
"Work of *Tully*, not with Pen and Ink,
"but by a certain ingenious Art, thro'
"the Aſſiſtance of my Servant *Peter de*
"*Gernſheim*, the fourth Day of *February*,
"in the Year of our Lord 1466.

Angelus Rocca in his Account of the *Vatican* Library (Printed at *Rome* in 1591) ſaith, that he had ſeen a Grammar written by *Donatus*, printed upon Vellum with this Inſcription at the Beginning:

> *Johannes Fauſtus Cives Moguntinus, Avus maternus Johannis Schæffer, primus excogitavit imprimendi artem Typis æreis, quos deinde plumbeos invenit, multaque ad poliendam artem addidit ejus Filius Petrus Schæffer: Impreſſus eſt autem hic Donatus primus omnium Anno Dom. M. CCCCL. Admonitus certe fuit ex Donato Hollandiæ prius impreſſo in tabula inciſa.* But this he doth not ſay was printed in the Book.

In an old Chronicle of *Colen*, printed in 1496, 'tis ſaid, that the Hint of this Art was given from *Holland*, where an Impreſſion of this *Donatus* had been made before that at *Mentz*. So that upon the whole, the Invention may be granted to *Holland*, but improv'd and propagated in *Germany*; whence it was carried again to *Holland*, and from thence brought to *England* very early by *Caxton* and *Tourner*, whom King *Henry* VI. ſent at his own Expence to learn it. Theſe prevail'd upon one of the Printer's Men at *Harlem* to ſteal away, and come with them to *England*, where being arriv'd, they ſet to Work at *Oxford*, and having taught other Men, Printing-Houſes were ſet up at *Weſtminſter* and *S. Albans*, *Worceſter*, and at other Places.

(*t*) [*Who obſerved the Art of Printing in* China.]

Several Hiſtorians tell us, that the *Chineſe* were wont to Print, and that that Art was in Uſe among them Time out of Mind. Some ſay, that it began with that Kingdom, and yet tell us, that it was in Uſe there about 5 or 600 Years before it came into *Germany*; which if it be ſo, then it will follow that the Nation of *China* is not above 600 Years ſtanding, which is againſt the Current of Hiſtory, which ſhews that People to be ancient enough.

Others tell us, that there were *Printers* in the *Indies*, who printed the Hiſtories and ſacred Ceremonies of thoſe Countreys after the ſame Manner as we do. Pope *Leo* ſhew'd to ſome of his Friends, one of their Volumes ſent to him for a Preſent by the King of *Portugal*. They are deſcribed by Travellers after this Manner: They have narrow and long Leaves of thin and ſmooth Paper whereupon they write, not from the Left Hand to the Right. nor (like the *Hebrews*) from the Right to the Left, but from the Bottom to the Top. One of theſe Books is to be ſeen in the *Vatican* at *Rome*, and in the *Laurentian* Library of King *Philip*, *i. e.* in the *Eſcurial* in *Spain*.

But now what do theſe Men tell us, but only that *Printing* was in Uſe in other Places, beſides *Europe*? But it will not follow therefore, that the *Germans* did not firſt invent it in this Quarter of the World. For what Abſurdity is it to ſay, that one and the ſame Thing is *New* and *Old* in reſpect of divers Nations? Thus the *French* Diſeaſe is but of Yeſterday (as it were) and not much above 100 Years old in theſe Parts, but hath reigned above 1000 in *America*. Thus *Typography* is old in *China*, but as found out in *Mentz*, it is a Modern Thing. And though ſome tell us, that it came from the *Chineſe*, and was propagated by the *Scythians* and *Muſcovites* into *Germany*, yet we cannot meet with any Colour of an Argument that favours the Opinion.

But how familiar and *common* ſoever Printing was in *China*, yet it is prov'd by Authors to vary and differ from ours; for they do not join their Letters as we do, but form the *Table* into ſingle Leaves, which hath Letters on both Sides. This Way, though it ſeems to be Laborious, yet they are very quick and ready in it.

Beſides, they are wont to make *White* Letters in *Black*, in which Thing they excel us; for the doing of this, they have Letters of *Stone*, upon which they lay a moiſtned Paper, which they thruſt into or join to the Cavities of the *Types* or Figures; now whilſt thoſe Parts ſo united or clapt into thoſe Hollowneſſes of the Characters or Types are more depreſs'd than the reſt, they *Tinge* the Paper all over with Ink, which becauſe it cannot reach and black the Bottoms of the Letters, therefore the Letters remain white.

Some rob the *Germans* of the Honour and Glory of this Noble Invention, and accuſe *John Fauſtus* of *Mentz*, the commonly reputed Author of it, for ſtealing this Art, and give the Credit of it to a Citizen of *Harlem*, one

Laurence Coſter. This Man (ſay they) walking in a Wood not far from the Town, began to make *Beechen* Bark into the Form of Letters, and Printed a Verſe or two as a Pattern for his Nephews. And having ſucceeded pretty well in this firſt Attempt, he began to project greater Matters, and invented the moſt glutinous clammy and thick kind of Writing Ink, and then figur'd or printed whole Boards with Characters. Some affirm, that they ſaw ſome *Adverſaria* printed after this Manner, as an Eſſay and Rudiment of his Work, and that only on every other Side, but not endorſed. Afterwards he changed his *Wooden* Characters into *Leaden* ones, and thoſe into *Tin* ones, as being more durable and ſolid, and leſs flexible and yielding. This Man, proſpering in his Invention, and growing Rich by his Trade never heard of before, began to like and be fond of his Employment; and therefore ſtill as he increaſed in *Wealth*, he increaſed and augmented the Number of his *Workmen*; among whom was this *John Fauſtus*, who being skillful in compoſing, and in all the Secrets and Myſteries of *Typography*, took his Opportunity (when they were all at Church) on a *Chriſtmas-Day*, to rob his Maſter of his Characters and Implements, and ſhewing him moſt cleverly a fair *Pair of Heels*, he troops to *Amſterdam*, and from thence to *Cologne*, and at laſt to *Mentz*, where he ſet up and open'd his Shop, to reap the Fruits of his cunning Knavery. This Story is atteſted by the Magiſtracy of the Town, and is by them tranſmitted down to Poſterity. But however *Germany* will not ſuffer the Honour of the Invention to be extorted from them.

The true Story of Printing is this: There was in the Year 1440. a certain Citizen of *Mentz*, *John Fuſt* by Name, who conſidering with himſelf, out of his great Love to Learning and Learned Men, that by reaſon of the *Scarcity* of Books, and the vaſt *Charge* in copying and tranſcribing them, many ingenious Perſons were diſcouraged from Study, began to think of a Way, how with leſs Labour and Expence, good Authors might be compaſs'd and procur'd. After ſome ſerious Thoughts upon the Matter, he at laſt popt upon this *Expedient*, which was the cutting of the Characters of the *Alphabet* in Wood, and to form them for an Impreſſion, and then to cover them with Ink, which, becauſe it was fluid, did run about the Characters, and moſt grievouſly confounded them, he found out at length after much Study, a black, glutinous, thicker kind of Subſtance, and put the *Alphabet* cut in Wood under little Preſſes, and ſo began to Print.

This his Art, becauſe never known before, and becauſe thoſe Wooden Alphabets were cheap and eaſy to be had, was much cried up and admired by all. Wherefore *John Fuſt* took an Occaſion, not only to cut *Donatus* after this Manner in Wood and to Print it, but alſo to ſtudy how to improve and perfect this Work, eſpecially ſeeing 'twas troubleſome and laborious to cut whole Columns or *Forms* (as they call them) in Wood; and therefore he found out this compendious Way, which was to cut in Pieces the Boards on which the Alphabetical Characters were *inciſ'd*, and to keep the good Letters, and to make others in the Room of thoſe that were worn; and ſo he began the compoſing or joining of the Letters, though he perceiv'd a very great Expence both of Time and Labour, in framing every Letter by it ſelf

But this *John Fauſtus* or *Fuſt* us'd other Mens Endeavours in this New Operation. Among the reſt whom he employed, there was one *Peter Schæffer*, who curiouſly obſerving his Maſter's Trade, was very deſirous to be inſtructed in it. And being a Man of ſome Parts, he endeavour'd to improve it; and indeed found out a Way how the Characters might be indented, or engraven into the *Matrices* (as they call them) and flow melted out of them. The Alphabet being thus cut, he ſhews the Letters that were melted or caſt in it to his Maſter, who was ſo tranſported at the Sight, that he gave him in Marriage his only Daughter. And though at firſt, there was ſome Difficulty in this kind of Characters, their Matter being not hard enough, yet afterward there was a *Mixture* found out, which was able to endure the Violence of a Preſs.

Things being brought to this Paſs, the Father-in-Law; and the Son-in-Law made all their Domeſticks ſwear *Secrecy*, and never to diſcover the Myſtery of this Art. The Tables of the Alphabet, which were the Rudiments of the Work, they kept very cloſe, and ſhew'd them at their Pleaſure to their Special Friends.

One *John Guttenberg* living at the ſame Time at *Mentz*, at the very next Door to *Fauſtus* or *Fuſt*, obſerv'd that *Typography* was very much applauded, and perceiving withal, that it was very beneficial, he contracted an Acquaintance and a great Familiarity with *John Fuſt*, and being a wealthy Blade, offered him Money for his neceſſary Expences, which was a Thing very grateful to *John Fuſt*, in regard he found the Charge to increaſe, and wanted Parchment to Print on. And therefore, he and *Guttenberg* made an Agreement to be Partners in the Matter, and (whether win or loſe) to ſhare and ſhare alike, and to be equally concerned touching the Expences about their Art : But *Fuſt* ſpending more than the other thought neceſſary, he refus'd to pay his Part or Proportion; whereupon a Difference ariſing betwixt them, they commenc'd a Law-Suit immediately at *Mentz*. And after an hearing or two, the Iſſue was this, that upon *Fuſt*'s ſwearing that all the Money laid out was not converted to his own private Uſe, but was wholly employ'd about the Art of *Typography*, *Guttenberg* ſhould pay, as really he ought, his promiſed Quota.

So that it is evident from the Premiſſes, that *Guttenberg* was not the firſt Author of *Typography*, but that ſome Years after it was found out, he was entertain'd as a Partner or Companion by *Fuſt*, whom he ſupplied with Money. Wherefore *Guttenberg* being ſentenc'd to bear Part in the Expences, and the Difference thereupon growing much wider betwixt them, having learn'd the Art, went from *Mentz* to *Straſburg*.

After this Quarrel, others who had acquir'd the Trade from *Fuſt*, began to leave him and went to *Frankfort*, and to other Places, eſpecially in the Year 1462. when *Mentz* was taken and deprived of its former Liberty. And ſo it came to paſs, that this Art was known, and was of publick Uſe.

This is the genuine Hiſtory of the Original of Printing, taken from ancient Monuments and Records, which are yet extant and remaining, and it may be confirm'd by many old Books which were then Printed. For *Fuſt* himſelf and his Man *Schæffer*, at the End of the Books which they Printed, did without any Contradiction profeſs, That he *John Fuſt* was the Inventor of *Typography*, and that *Peter Schæffer* was his Aſſiſtant, as it will appear from the Sequel: For in the Library of the Electoral *Palatinate*, there were ſeveral Bibles; from whence, theſe following Lines annex'd at the End were taken; *viz.*

> *Præſens Rationalis Divinorum Codex officiorum venuſtate Capitalium decoratus, Rubricationibuſque diſtinctus, artificioſa adinventione Imprimendi, ac Characterizandi abſque calami exaratione ſic effigiatus, & ad Euſebiam Dei induſtrie eſt conſummatus per Johan. Fuſt Civem Moguntinum & Petrum Gernſheim Clericum ejuſdem Diœceſis. Ann. Dom.* 1459. *ſexto Die Octobris.*

i. e.

“ This ſacred Book beautify'd and mark'd
“ with red Capital Letters, was made
“ and finiſhed to the Divine Glory, not
“ by the writing of any Pen, but by
“ the Artificial Invention of Printing
“ by *John Fuſt* Citizen of *Mentz*, and
“ *Peter Gernſheim* Clerk of the ſame
“ Dioceſe. *Anno Dom.* 1459. and the 6th
“ Day of *October.*

Another of this Nature may be ſeen at the End of *Tully*'s *Offices*, in the Library at *Mentz*, as was ſaid before; or you may take the Story in ſhort thus. Some ſay that one *Laurence Coſter* of *Harlem*, found out this Art of Printing by accident, who walking in the neighbouring Wood for his Diverſion, fell to whitling little Sticks he took up, and at length form'd a Letter upon one of 'em, which preſſing upon his Hand firſt, and afterwards with Ink upon Paper, found it made a legible Impreſſion, which accidental Hint, being an ingenious Man, he improv'd and brought the Art to Perfection; when a roguiſh Servant he had employ'd in it, ſtole his Implements, and run away to *Mentz*, and there ſet up for the Inventor. They of *Mentz* deny this, and affirm that a Citizen of theirs, *John Fuſt* by Name, was the ſole Inventor. The *Harlemers* have many great and learned Men on their Side in this Diſpute: However, the firſt printed Books extant, having been publiſh'd at *Mentz*, carries over many to the other Party.

CHAP. XIII.

Of Paper.

(u) THE Invention of Paper is alſo very beneficial, in regard Men formerly were at very great Charges for writing. And to enlarge a little upon this Subject, *Pliny* in the 11th Chapter of his 13th Book, and *Virgil* in the third of his *Æneids*, tells us that the Ancients were wont to write on (w) *Palm-Leaves*, according to thoſe Verſes of the Sibyl.

Inſanum vatem aſpicies, quæ rupe ſub imâ,
Fata canit, foliiſque notas, & carmina mandat.
Quæcunque in foliis deſcripſit nomina Virgo
Digerit in numerum, atque antro ſecluſa relinquit.

i. e.

" The mad prophetick Sybil you ſhall find,
" Dark in a Cave, and on a Rock reclin'd:
" She ſings the Fates, and, in her frantick Fits,
" The Notes and Names inſcrib'd to Leafs commits.
" What ſhe commits to Leafs, in Order laid,
" Before the Cavern's Entrance are diſplay'd:

And hence the Expreſſion *Folium Chartæ*, a Leaf of Paper, though not written on a Palm-Leaf.

Afterward they began to write on the (*x*) thin *Films*, or Skin growing between the Bark and the Tree, which are call'd by the Latins, *Libri*. And hence it is that whatever is written upon, is call'd *Liber*.

But in regard this Matter was frail and brittle, they began to record publick Memoirs in (*y*) Volumes of *Lead*, and private Matters in (*z*) *Linen*. And at length they found out the way of writing on (*a*) *Wax*, which they ſpread on thin Tables, and then made Letters upon it with an iron (*b*) *Style*. And hence it is that the manner of writing, or the peculiar Tenour or Strain of Phraſe is call'd a *Style*. (*c*) Thoſe Tables among the Latins had ſeveral Names, as *Pugillares*, *a pungendo*, and *Tabulæ*, & *Codicilli cerati*.

(*d*) After *Alexandria* was founded by *Alexander* the Great, *Papyrus*, a ſedgy kind of Weed was found out in the Fens of *Egypt*, and in the ſtagnant Waters of the *Nile*; and this Ruſh, its Threads of Pith being taken out by a Needle, they divided and ſlic'd into thin Films, or Skins, which they call'd *Chartæ*, from a City of *Tyre* of that Name, near unto which this Bulruſh grew. And therefore whenever we meet with the Word *Charta* in Latin Authors, it is to be underſtood of Paper.

When *Ptolomæus Philadelphus* erected a Library, furniſh'd almoſt with 1700 Volumes, *Eumenes* out of Emulation built another on purpoſe to out-do him; at which *Ptolomy* being ſomewhat concern'd, forbad the Exportation of Paper out of his Territories, and by that means prevented him from writing Books. *Eumenes* underſtanding, and being ſenſible of this, found out at *Pergamus* another way of making Paper, for he was wont to flea Beaſts, and of that thin Film or Skin next to the Hide or Pelt, he made a ſort of Paper to write on, call'd (*e*) *Membrana*, ſo nam'd from covering the Members of Animals, or becauſe the Latins call'd the Skin or Hide by that Name. 'Tis call'd alſo *Pergamena*, from the City *Pergamus* (now *Bergamo*) where it was firſt found out, as *Pliny* tells us in his 13th Book.

(*g*) *Joſephus*, in the 12th Book of his Jewiſh Antiquities, ſaith, that *Eleazer* the High-Prieſt ſent the *Septuagint* wrote in Parchment to *Ptolomæus Philadelphus*, which if it be true, we muſt needs grant that Parchment was found out before *Eumenes*, but that he only took great Care for vaſt Quantities of it to be made, and convey'd over all *Aſia* and *Greece*, and therefore was the commendable Author of it.

When the *Lombards* came into *Italy*, they uſ'd ſmooth and thin Boards, which I ſaw my ſelf, and read, though written in *Lombard* Characters.

(*b*) At laſt was found out the way of making Paper of *Rags* ground and macerated, and ſteep'd in Water, upon which a Man may write very commodiouſly, and with great Convenience; and here the ancient Word Paper is ſtill in uſe. And thus you ſee that that Matter or Stuff whereon we handſomely write, is at once ſuccinctly and hiſtorically deſcribed.

The COMMENTARY.

(*u*) [*The Invention of Paper is very beneficial*, &c.] Experience can teſtify this, in regard Antiquity was formerly at ſuch vaſt Expences for writing; ſo that the Books of *one Author* then, were ſold for more than a *whole Library* now; becauſe *four* Men can *print* more in three Months, than *ten* (though ſwift Scribes) can *write* in twelve. So that the Price of laborious *tranſcribing* being brought down, every private Perſon may furniſh himſelf with Books, as well with a *little Money*, as Princes and Nations could before with vaſt Sums.

(*w*) [*They were wont to write on Palm-Leaves.*] Some ſay, that for *Palmarum Folia*, we muſt read *Malvarum*. *Virgil* tells us that the Ancients were wont to write on *Leaves*.

------ Foliis nec carmina manda,
Ne turbata volent rapidis ludibria ventis.
------ "Commit not thy Prophetick Mind
"To fleeting Leaves, the Sport of every Wind.

And *Juvenal* affirms the ſame in his eighth Satyr.

Credite me vobis Folium recitare Sybillæ.
"Believe it, I a Sybil's Leaf recite.

'Tis reported by ſome Authors, that this way of writing is in uſe among the *Indians*, who write not with *Ink* and *Paper*, but with an *iron Pen* or Inſtrument call'd a *Style*, on Leaves of Trees, which for Likeneſs ſake they call Leaves of Palm, though we ſhewed you before in the firſt Chapter of the ſecond Book, that there were no Palm-Trees in the *Indies*.

They cut the Leaves ſo as to make them even, and of an equal Length, and preſerve in theſe Books for a long time the Memoirs and Hiſtories of many Ages. They bore a Hole thro' the Ends or Extremities of the Leaves, and join them together with two ſmooth Sticks bor'd juſt after the ſame manner, ſo that the Leaves being laid in order, and the Sticks faſtned to them, they put Strings through the Holes, and roll them up and tie them cloſe, and winding the Surpluſage of the String about them, they bind them up with a faſt Knot. And when they go to read, they looſen the Strings, and lay them open before them. And from this Cuſtom of writing on Leaves it is, that the Pages of Books are called *Folia* even to this Day.

(*x*) [*Afterward they wrote on the thin Bark*, &c.]

Of Trees, *i. e.* of Aſh, Maple, Beech, Elm and white Poplar; and from hence it is that whatever is written on is called *Liber*.

(*y*) [*And then in Volumes of Lead.*]

Of which we may read in the 10th Chap. of *Job*, ver. 23, 24. *Oh that my words were written!*

Oh that they were printed in a Book! That they were graven with an iron Pen, and lead in the Rock for ever.

(*z*) [*And then private Matters in Linen.*]

Livy mentions theſe Books in his 1ſt Decad, and the 4th Book. [*Licinio haud dubie linteos libros ſequi placet.*] And again, [*Nil conſtat niſi in libros linteos relatum inter magiſtratus Præfecti nomen.*] The Name of a Præfect muſt be enrolled in *Linen* Books among the reſt of the Magiſtrates. *Vopiſcus* in the Life of *Aurelian*, ſpeaks of them. [*Et ſi his non contentus fueris, lectites Græcos, immo Linteos libros requiras, quos Ulpiana tibi Bibliotheca cum volueris miniſtrabit.* i. e. If not content with theſe, read *Greek*, nay *Linen* Books, which you may have in the *Ulpian* Library.

Theſe *Linen* Books of the Ancients were not like ours (which yet without a Solœciſm may be call'd *Lintei*) but were drawn on a Linen Web, juſt as various Images are pourtray'd by Painters on Pieces of Cloth. We may add to theſe the *Parthian* Garments, into which they did rather interweave Letters, than make Paper of *Egyptian* Bulruſh, which is a Wonder to ſome, in regard they have ſo great Plenty of it.

(*a*) [*At length they found out the way of writing in Wax.*]

As for theſe waxen Books, we are to underſtand by them, *Schedæ*, which were Boards or *Tabellæ ſectiles*, (not unlike Shingles of Wood, which cover Houſes inſtead of Tiles) which, that they might be fit to write upon, they did not only ſmooth and plain them, but moſt exquiſitely poliſh them, and carefully over-ſpread them with Wax, by reaſon of their hardneſs, being unfit both to receive Letters, or to blot them out.

(*b*) [*With an iron Style.*]

They wrote not with *Pen* and *Ink*, but with an Inſtrument of *Steel* or *Iron*, pointed at one end, and broad and ſharp at the other; with the broad end they *ſcrap'd* out what they had written, whence *Stylum invertere*, is to ſay and unſay a thing, and to turn his Punch the wrong end downward, as if to obliterate that which one had formerly written.

And as we uſe this Word [*Manus*] for the writing it ſelf, according to that of *Tully* in his Speech againſt *Catiline* [*Cognovit Manum & Signum ſuum*] ſo in the like Senſe we uſe this Word [*Stylus*] to ſignify the peculiar *Tenour* and *Strain* of Phraſe, which any Man uſeth in compoſing an Oration, Epiſtle, or the like. They ſay that the *Græcians* or *Thuſcans* were the firſt that made them; the *Romans* afterward us'd, inſtead of it, an Inſtrument made of a *Bone*, for they prohibited *iron* ones, as is noted in that Law, [*Ceram Ferro ne Cædito.*]

(*c*) [*Theſe Tables*, &c.]

Laſtly, They wrote their Books on Tables, which had ſeveral Names, as *Tabulæ*, *Tabellæ*, from their plain Form and Smoothneſs; *Pugillares*, becauſe *Pungendo ſcriberentur*; *Codicilli*, *a Caudicibus*, properly the Stumps and Stocks of Trees, of which theſe Tables or Books were made; *Cerati*, waxen, becauſe dawb'd over with Wax. The *Romans* wrote Books in *wooden Tables* cover'd with Wax, call'd in Latin *Ceratæ Tabulæ*.

But we find the Matter of Books not only to be Leaves of Plants, Rinds of Trees, Lead and Linen, Wood and Wax, which hitherto we have ſpoken of, but alſo Ivory and Stones, Braſs, and Intrails of Beaſts, Paper and Parchment.

Ulpian makes mention of Books of *Ivory*, which *Vopiſcus* calls *Elephantini*, in theſe Words [*Ne quis me Græcorum alicui, &c.* i. e. *Leſt any one ſhould think that I have too raſhly credited the Greeks or Latins, the Ulpian Library hath an Ivory Book*, [Librum Elephantinum] *wherein is written the Decree of the Senate*, &c.] 'Tis ridiculous to think they were call'd ſo from their *Bulk* and Largeneſs, as if the Greatneſs of that Creature was the Occaſion of the Name.

As for Books of *Stone*, *Enoch*, the ſeventh from *Adam*, prophecy'd (*vid. Jude*'s Epiſtle) of future Judgments, of a *Deluge* and *Conflagration*; and the better to tranſmit his Aſtronomy and other Learning to Poſterity, and to preſerve his Predictions and other Precepts, he wrote them on two *Pillars*, one of *Stone*, and the other of *Brick*, that if one happen'd to periſh in the Flood, the other might remain. *Joſephus* teſtifies that the former was to be ſeen in *Syria* in his Time.

Herodotus tells us in his *Urania*, that *Themiſtocles*, in the time of *Xerxes*, did engrave on Stones, which the *Ionians* coming the next Day to *Artemiſium*, did read. And *Iamblicus* confeſſeth that he took the *Dogmata* of his occult and myſtical Learning from the *Columns* of *Mercury*, which he ſaid were full of the Learning of the *Aſſyrians* and *Egyptians*. I forbear to inſiſt on that infinite Number of

Marble Monuments, which are a ſufficient Proof of *Books* of *Stone*. We are not ignorant how the *Danes* took care to have the noble Exploits and Atchievements of their Anceſtors (writ in Verſe in their own Language) to be engraven and cut in Stone and Rocks: So deſirous were they to preſerve their Memory, that they made uſe of huge *Moles* inſtead of Volumes, and borrow'd the uſe of Books even from *Shelves* and *Quarries*.

There is no doubt to be made but that the Ancients were wont to write on *Braſs*, the uſe of that Metal being now transferred for the perpetuating of Monuments (as *Pliny* tells us) to *brazen* Tables, whereon were engraven publick Conſtitutions. And *Tully* (in his *Catiline*) ſaith, that *Æra legum*, *i.e.* Laws written in Braſs, were ſtruck with Lightning in the Capitol.

'Tis evident that the twelve Tables were engraven in Braſs, and that *Veſpaſianus Auguſtus* took care for the reſtoring three thouſand Tables of Braſs, inſcrib'd with publick Memoirs burnt in the Capitol, when he ſearch'd for the *Originals* of which they were the *Tranſcripts*. We find in the firſt Decad of the third Book of *Livy*, that a Truce made with the *Latins*, was written on a Pillar of Braſs. And we read in the *Maccabees*, that when *Judas Maccabeus* and the People of the *Jews* deſir'd a Peace and a Confederacy with the *Romans*, the Senate ſent them an Epiſtle to *Jeruſalem*, written in Tables of Braſs, about the Ratification of the League of Amity between them, 1 *Maccab.* 8. 14.

We read that one *Talus*, in the time of *Minos* and *Rhadamanthus*, carry'd Tables of Braſs about the Iſland of *Crete*, wherein their Laws were written and engraven; from whence he was called *Æreus.* There are many pretty Stories about this *Talus*, which for a little Diverſion we ſhall preſent you with here. He was made (they ſay) of Braſs by *Vulcan*, and was ſent as a Prieſt to *Minos*, for the Defence of the Iſland, about which, to watch it, he went thrice a Year. Some ſay all his Body was of Braſs, but a little *knob* at the bottom of his Heel, that was skin'd over with a thin *Membrane*, which if broken off, he infallibly dy'd. Others ſay that this *Brazen* Fellow came to *Sardinia* firſt before he came to *Crete*, where he had deſtroyed abundance of Men. *Euſtathius* on the 20th *Odyſſ.* ſaith, that when he intended to kill any body, he leap'd into the Fire, and when he began to be red-hot, he would skip into a Man's Boſom, and immediately burn him. 'Tis probable he was call'd *Æripes*, *i. e.* Brazen-Foot, becauſe he was moſt obſervant of thoſe Laws that were written in that Metal, and carry'd them about the whole Iſland of *Crete*; juſt as *Ragnachildu* the Wife of *Theodorick*, King of the *Goths*, was fabled by Antiquity to be one of the Nymphs, and to have Feet like Geeſe, not that ſhe had really ſuch ſwimming Claws, but that ſhe wonderfully delighted in Waters and Rivers, and had ſoft and tender Feet, and thoſe exceeding in Whiteneſs the Feathers of that Fowl.

We read alſo in Hiſtory of Books made of the *Intrails* of Beaſts; for in the Reign of *Baſiliſcus*, there happen'd a great Fire in *Conſtantinople*, which conſum'd the Palace, together with the Library of an hundred and twenty thouſand Books; among which there is ſaid to have been the *Intrails* of a Dragon 120 Foot long, on which were written in golden Letters the *Iliads* and *Odyſſes* of *Homer*, and the Hiſtory of the Atchievements of many Heroes.

(*d*) [*Paper was found out*, &c.]

We come now to ſpeak of Books made of Paper, *Charta* differs from *Papyrus*, as the Effect doth from the material Cauſe; for *Charta* is made of *Papyrus*, which grows in the Fens of *Egypt*, or in the ſtagnant Waters of the River *Nile*. And this is the way or manner of making it.

The Stalk of this Ruſh *Papyrus* (the two ends being cut off as unfit for the Buſineſs) they ſplit long-ways into two equal Parts, from which they took ſeveral thin Films, which the further they are from the outmoſt Bark, the better they are, as the nearer the worſe; ſo that there are ſeveral ſorts of Paper, of which hereafter. They were wont to ſeparate theſe Skins or Rinds from the Stalk, with a ſharp Iron about two Fingers broad, a Needle being laid aſide as uſeleſs in the Buſineſs. Of theſe Skins, or Films, or Sheets (call'd promiſcuouſly by *Pliny*, *Ramenta*, *Papyrus*, *Tabulæ*, *Schedæ*, *Cutis*, *Plagulæ*, *Coria*, *Statumina*, *Subtegmina*, *Paginæ*, *Tæniæ*.) I ſay, of theſe Films pull'd from the Stalk of the Ruſh [*Papyrus*] laid one upon another, ſome in a direct, and others thwartingly and in a *tranſverſe* Poſition, *Paper* was made. Some ſay that theſe *Filaments* were weav'd, the Water of *Nile* being inſtead of Glue, not the pure and limpid, but the muddy Element thickened and fatned with the clammy Juice of the Earth. This glutinous Paper was beaten with Mallets, and was ſmooth'd from Wrinkles with Strokes and

Blows; and therefore *Ulpian* diſtinguiſheth between *malleatos*, and *non malleatos libros*, i. e. of Books made of Paper that was pounded, and thoſe that were not.

There are eight ſorts of Paper mentioned by *Pliny*.

1. *Claudian*, which was made firſt by *Claudius Cæſar*, of *Auguſt* or *Hieratick* Paper, only adding thereto a third Film to the two former, and making it eleven Fingers broad.

2. *Hieratick*, from ἱερὸν, *ſacrum*, i. e. holy, becauſe us'd by the Ancients in religious Volumes. 'Twas afterwards call'd by the flattering Titles of *Auguſtan* and *Livian*, and from its Authority in Letters, *Epiſtolary*, and becauſe the Beginnings of Miſſives are full of Compliments, 'tis call'd by *Martial*, *Salutatory*.

Marcus amat noſtras Antonius, Attice, Muſas,
Charta ſalutatrix ſi modo vera refert.

i. e.

" Beloved is my Muſe by *Anthony*,
" If the ſaluting Paper tell no Lye.

3. *Fannian*, ſo call'd from *Q. Rhemnius Fannius*, a famous Grammarian, who had (as *Suetonius* tells us) whole Shops of Paper to ſell. This *Blade*, by refining at *Rome*, and by making the coarſer ſort more *auguſt* and *elegant*, ſeem'd to have invented a new *Species*, calling it after his own Name.

4. *Amphitheatrical*, which differs from the *Funnian*, as rough Diamonds and Carbuncles differ from Jewels cut and poliſh'd; and as much as the ſame Woman newly out of her Bed, with her Hair about her Ears, differs from her ſelf when ſhe hath dreſs'd her Head, waſh'd

her Face, and flutters about in her flaming Glories. 5. *Saitica*, from the Town *Sai.* 6. *Tæniotica*, ſome ſay *Tanitica*, from the City *Tani*, now *Damiata* 7. *Emporitica*, ἀπὸ τῶν ἐμπόρων, ſo call'd from Merchants, becauſe not fit to be written on, it was us'd by them to wrap Wares in. 8 *Macrocollum*, ſo call'd from large Films, ἀπὸ τοῦ μακροῦ καὶ κόλλα, *corium*, i. e. large Paper or Skin to write upon.

(*e*) [*A ſort of Paper called* Membrana.]

We find the uſe of theſe Skins or Films to be very ancient; for ſome underſtand by *Diphthera*, the Skin of the Goat that ſuckled *Jove*, wherein Antiquity believ'd he wrote all things he did. And therefore thoſe things that are not extant in the *Monuments* of Hiſtory, nor kept and preſerv'd in the *Memory* of Man, are ſaid to be fetch'd from *Jove's Diphtheræ*.

And we read in *Herodotus*, that the *Ionians* call'd Books *Diphtheræ*, becauſe by reaſon of the want of Paper, they us'd the Skins and Hides of Sheep and Goats. And ſome underſtand by the *Golden* Fleece (which the *Argonauts* brought from *Colchis*) *Diphthera*, *i. e.* a Book (according to the ancient way) made of Parchment, containing the Secrets of Chymiſtry, which unfolds the Art of making Gold, and was juſtly ſtyl'd *Golden*, from the vaſt Emolument brought in by it. It is evident from the ſecond Chapter of the 12th Book of *Joſephus*, that thoſe *Diphtheræ*, or Writing-Skins of the Ancients, did not differ from thoſe Parchments ſent by *Attalus* or *Eumenes* from *Pergamus*.

(*f*) [*Paper firſt found out at* Alexandria, *&c.*]

Pancirollus had this from *Varro* and *Pliny*, but 'tis confuted by *Melchior Guilandinus*, in his

Treatiſe of Paper, who ſhews that Paper was long in uſe before that Time.

(g) Eleazer *ſent the Septuagint wrote in Parchment to* Ptolomy Philadelphus.]

The Emulation between *Ptolomy* and *Eumenes* about their Libraries, was after the Tranſlation of the Scriptures into Greek; wherefore it was a long time afterward that *Ptolomy* forbad the making of Paper, and ſo conſequently that *Eumenes* invented Parchment inſtead of it; from whence it is clear that Parchment was long in uſe before that Conteſt.

(h) [*At laſt was found out the way of making Paper with Rags.*]

In regard this Art is ſo rarely well deſcribed by one *John Ruellius*, an expert Phyſician, and is commonly known to every one almoſt, eſpecially to thoſe who have ſeen the Mills made for that purpoſe: We ſhall therefore forbear to trouble the Reader with any thing more on the *Argument*, only give us leave to add this one Thing, *viz.*

That the uſe of Letters or Epiſtles was utterly unknown to the *Americans*; for when a *Spaniard* gave a Letter to one of them to be convey'd to his Friend, theſe miſerable Wretches could not imagine how a Paper chequer'd with black and white could *ſpeak*.

A *Spaniard* ſent a Dozen of *Indian* Rabits to his Friend roaſted (to prevent tainting) by an *Indian*, who, when he was ſharp-ſet, eat three of them on the Way. At his Return he deliver'd a Letter of Thanks for nine Conies. His Maſter having perus'd the Paper, accus'd the *Indian* for *embezzling* three. The Fellow deny'd it, and would have ſtoutly born him down that he had carry'd the whole twelve, until his Maſter had ſhew'd him the Letter; at the Sight of which, he ſtood bluſhing and *ſtinking*, and confeſs'd the Truth, and adviſ'd his Companions to have a ſpecial Care of *twatling* Papers.

CHAP. XIV.

(i) *Of Cyphers, Private Notes, or Characters of Letters.*

(k) I Take theſe *Notes* and Characters now in uſe to be altogether new; and for a more juſt Diſcourſe upon the Nature of them, I think it not improper to reflect a little backward.

The *Lacedæmonians* had a more abſtruſe way of writing than by *Notes* of Letters; and that kind of Epiſtle they call'd σκυτάλην, (l) *Scytalam*, *i. e.* a Staff that they uſed to write private Letters on, which was done after this manner. There were two round, long and ſmooth Sticks of an equal length and thickneſs; one of theſe was given to the *General* when he went to War, and the other to the *Magiſtrate* that ſtay'd at Home. When there was an occaſion for ſecret Communication, they wound once about this Stick a pretty ſlender Membrane, but long enough for the Buſineſs, ſo as that the Edges of it might meet and join; and athwart the Juncture of thoſe Edges they wrote Letters from the top to the bottom. The written Membrane was roll'd off from the Stick, and ſent to the General, who was privy to the writing. The rolling off of the Membrane render'd the Letters *maim'd* and imperfect, and much diſplac'd both their Heads and Members into a great Confuſion; ſo that if the Membrane had happen'd in the Enemy's Hand, they could have made nothing of it, being not able to gather any thing from the *writing*. But now the Party to whom it was ſent, took and wrapt it about its Fellow-ſtick, *i. e.* that which he had equal to the other in all reſpects; ſo that the Letters meeting together as they did in the former, did moſt legibly repreſent a perfect *Epiſtle*.

This kind of *Miſſive* the *Roman* General us'd after the ſame manner; for he gave to the *Senate* a round poliſh'd *Stick*, and kept another to himſelf juſt like it, which he ſwath'd (as it were) in a long Paper or Parchment, which when roll'd off from the Stick, he diſpatch'd to the *Senate*, who winding it about theirs, did read it exactly. But this way of *Epiſtolizing* made uſe of no *Notes*, yet you ſee there was a ſecret Combination or *Compact* about the interrupting the Poſition of Letters, ſo as to render them *illegible* to a third Perſon.

One *Tyro*, a Servant formerly of *Cicero*, invented Notes, ſo as that one Letter ſignify'd a *Præpoſition* or an *Adverb*. After him *Perſannius*, *Philargius*, and *Acilius*, a Servant of *Mecænas*, by the Addition of others, improv'd the Invention of *Tyro*; (*m*) for every particular Letter ſignify'd a Word; as for Example, *R. P.* ſtood for *Reſpublica*, (*n*) *P. R.* for *Populus Romanus*, and ſo of the reſt; but theſe are rather *Abbreviations* than *Notes*.

(*o*) *Cæſar* did ſo alter and change the Property of Letters, that every fourth one ſignify'd the firſt: But (*p*) *Auguſtus* put the *ſubſequent* for ſor the *precedent*, as B for A, and D for C, *&c.* as *Suetonius* and *Dio* inform us. Theſe were Notes or Characters, in regard there were Letters, and thoſe not underſtood.

Some found out the way of putting Numbers for Letters, as the Figure of 1 for A, the Figure of 2 for B. (*q*) Others have tranſpos'd the Alphabet according to their Fanſy or Pleaſure. (*r*) And a third ſort have found new Characters. Laſtly, One of *Breſcia* publiſh'd in *Print* a way of writing, which he thought impoſſible to be underſtood, unleſs a Man had had a *Counter-Copy* of it; but he was deceiv'd, for I have heard his writing *unriddled* and explain'd.

And there are no Notes or Characters ſo difficult and obſcure, but are very intelligible to thoſe who are vers'd and exercis'd in this way of writing, of whom there are ſeveral at *Venice.* And I had at home in my Houſe a learned young Gentleman, *Jerome*, the Son of *Francis Nani*, a noble *Venetian*, who was ſo well skill'd in this Art, that he underſtood all Characters that were brought to him, though never ſo hard and abſtruſe.

The COMMENTARY.

(*i*) [*Cyphers.*]

The Word *Ziſera*, *Ziphra*, *Siphra*, or *Cyphra*, (for 'tis written many Ways)is purely *Arabick*, but is not always in the ſame Senſe. It ſeems to be deriv'd from the Hebrew Word *Saphri*, which (according to *Schindler* in his Pentaglot) ſignifies, 1. To number, and thus we underſtand by theſe Cyphers the nine numerary Figures, *viz.* 1, 2, 3, 4, 5, *&c.* which are call'd *Saracenical*

cenical Cyphers; or, 2. To mark or note, and then we mean by them any Characters or Notes, the Indications or Signs of any Thing, Word, or Letter, which are call'd *Furtivæ Literarum Notæ*, i. e. Private Characters of Letters, ſound out on purpoſe for the writing myſtically and obſcurely, and then they are ſtyl'd by *Baptiſta Porta* and others, *Ziphera*.

Others affirm the Word [*Ziphera*] to be deriv'd from the Arabick *Zaphara*, which ſignifies *vacuum*, *inane*, as it were a Mark of Nullity or nothing. And taken in this Senſe, *Bap. Porta* hath a Volume about them; *Trithemius* alſo hath a Treatiſe of *Stenography*, and that abſtruſe enough, which among ſeveral others, *Guſtavus Silenius* undertook to interpret. *Blaiſius* and *Vigenerius* have publiſh'd ſomewhat in *French* on this Subject.

But now new Methods of writing things of moment in theſe Characters are daily found out and made uſeful, eſpecially by the *Secretaries* of Princes, as oft as they have a mind to write obſcurely, ſo as not to be underſtood by every Reader.

This *Cryptick* way of writing was frequent and common in our Civil Wars, there being ſcarce any Man of Eminency, but in the Communication of Matters of moment, made uſe of theſe *Cyphers*, and veil'd his Senſe in theſe myſtick Characters, that it might not be underſtood, in caſe it fell into the Enemy's Hands. Many ſuch Letters in the War time, were ſent to the learned Dr. *Wallis*, Profeſſor of Mathematicks in *Oxford*, to be interpreted by him. They were wrapt up in ſeveral abſtruſe and ſecret Methods; ſo that ſome were ſo intricate, that he almoſt deſpair'd of ever *unfolding* them; yet his indefatigable Induſtry, attended with a *Sagacity*, and a *dextrous* Faculty that way, did at length *unriddle* them. There are ſome choice *Specimens* of his excellent *knack* as to that Particular, to be ſeen in the publick Library of that famous Univerſity.

(k) [*I take theſe Characters or Notes to be new.*]

But in Submiſſion to our Author, we can eaſily prove, and that by great Authorities, that Antiquity us'd theſe ſecret Characters or Notes in writing; for not to inſiſt on the *Egyptian Hieroglyphicks*, we are told by *Ammianus Marcellinus*, that that People were wont to write ſo, as that every Letter ſtood for a Word, and every Word ſignify'd a Sentence. This manner of writing was alſo in uſe among the *Greeks*, for we read that *Homer*'s *Iliads* were ſo curiouſly writ on a Parchment, that they were eaſily crowded into the Womb of a *Nut-ſhell*, and they muſt needs be written in *Notes* and *Characters*, and thoſe very little, and moſt exquiſitely ſmall. *Myrmecides* is ſaid to have written an *Elegiack Diſtich* in golden Letters on the leaſt of Seeds, that's call'd *Seſamus*; and therefore 'tis conjectur'd 'twas done by Characters, or theſe private Notes. The Ancients ſeldom us'd whole Letters in writing, and therefore *Galen* mentions a Book ὁλογραμμάτων, of *Menecrates* a Phyſician, which was written in entire Letters. They us'd them in writing their Laws, Edicts and Decrees, as the only Book of *Valerius Probus* will abundantly teſtify, and alſo a Diſtich in *Manilius*, in his Book of Aſtronomy.

Hic etiam legum Tabulas, & condita jura.
Noverit atque notis levibus pendentia verba.

i. e.

“ He knew the Laws, and ſecret Edicts quotes;
“ And alſo Words expreſs'd in private Notes.

This compendious way of Writing was alſo in Uſe among the *Romans*; for *Dio* tells us, that *Mecænas* was the Author of theſe *Cyphers*, whereby he wrote apace, and made them Publick by his Servant *Acilius*. This Way of Writing was ſo Familiar, that *Marcellinus* tells us, that even Girls wrote Letters in theſe hidden Characters.

Scriveners and Librarians uſed theſe Notes, in tranſcribing the Books of the ancient Lawyers; but when the Knowledge of theſe Cyphers, together with the Study of the Law, and other Learning began to be loſt through the Tumult of War; ſo that the Notes were as hard to be underſtood, as the Things they expreſſed, and becauſe many were deceiv'd by the too curious, ſubtil, and various Interpretations of them, ſo that great Obſcurity did ariſe thereupon: I ſay, for theſe Reaſons and Conſiderations, *Juſtinian* enacted, that no Law-Books any more ſhould be copied out in them, leſt by falſe Interpretations, and unskilful Explications, the genuine Senſe of the Words ſhould be perverted. For if *Juſtinian* ſhould ſend to us the ancient Law-Books deform'd and corrupted and *ſtigmatiz'd* (as it were) with theſe Notes or Characters, who would be able to unfold their Intricacies, or by explaining their Meaning, could ſilence and put an end to Cavils and Diſputes, when *Trebonian* and himſelf were frequently gravel'd in the unriddling of them. Sometimes he render'd them very ill, giving them a Senſe quite different from the true, and ſometimes he took *Notes* for *No-Notes*, and ſometimes (on the contrary) *No-Notes* for *Notes*.

(*l*) [*The* Lacedemonians *uſed* Scytala].

The Word ſignifies a kind of private Epiſtle, wherein were written myſterious Matters or ſecret Concerns; a Staff whereon the *Lacedæmonians* were wont to write their private Letters. 'Tis deſcrib'd ſo by *A. Gellius* in the 17th Chapter of his *Attic. Noct.*

(*m*) [*Every particular Letter ſignifies a Word*, &c.]

Cicero is ſuppoſed by ſome to have written a Book like a Dictionary, wherein he prefix'd before every Word a ſeveral Note or Character, by which it was ſignified. And there was ſo great a Plenty of Notes and Words, that whatever could be written in *Latin*, might alſo be expreſs'd in *Cyphers* or Characters.

(*n*) [R. S. *ſtands for* Res publica.]

There were two Ways of this kind of Writing in Uſe among the *Romans*, the Foot-ſteps whereof have arriv'd to us, one by Notes, the other by *Sigla*, both which are uſed either for Expedition or Secrecy. They wrote *per Sigla*, when ſo many Letters ſignify'd ſo many Words: Thus the *Roman* Names and their *Prænomina* were ſeldom mentioned, but we read M. T. Cicero for *Marcus*, *Tullius*, *Cicero*, D. for *Decius*, Cn. for *Cnæus*, P. for *Publius*, Q. for *Quintus*, S. P. D. for *Salutem*, *Plurimam*, *Dicit*, A. V. C. for *Anno Urbis Conditæ*. M. S. *Memoriæ ſacrum*. They were call'd *Sigla* q. *Singulæ*, becauſe *Singulis Literis totidem voces ſignificabant*, *i. e.* by ſo many Letters they ſignified ſo many Words, or rather, becauſe they were *Signula*, *Parva ſigna*, *i. e.* little Signs; for it is but a ſmall Matter for *n* to be left out in *Sigla*, which is in *Singula*, in regard 'tis a Letter next to *g*, for we ſay *Singula*, *Sigillatim*, *Lingua*, *Ligula*, *Signum*, *Sigillum*.

Beſides theſe *Sigla*, the *Romans* had Notes or Characters; the Difference between them is this; *Sigla* were *Abbreviations* made by other foreign Characters, whence they were call'd *Notarii* by the *Romans*, who wrote the Speeches of others in ſhort Notes, as *Stenographers* among us, *ex. gr.* when Letters of the Alphabet are put for *Numbers*, as C. for *Centum*, M. for *Mille*, this is writing *per Sigla*: But when other Characters are uſed to expreſs them, ſuch as the *Saracenical* Cyphers, 1, 2, 3, 4, *&c.* This is writing by Notes.

(*o*) [Cæſar *ſo alter'd and chang'd the Property of Letters*, &c.]

As for *Caſar*'s Way of writing his Letters to *C. Oppidus* and *Balbus Cornelius*, who manag'd his Concerns in his Abſence, there is an excellent Commentary upon it in *Probus* the Grammarian.

(*p*) [Auguſtus *put the Subſequent for the Antecedent, as* B. *for* A. &c.]

There is a Letter of his that goeth about, to this effect, written to his Son, *viz.* Becauſe many Things fall out which both of us are oblig'd as well to conceal as to write, let us therefore contrive ſuch Notes between us, that whatever is written, it may be done ſo, as that the ſucceeding Letter may be put for the foregoing, *i. e. B.* for *A.* *C.* for *B*, and *Z.* for double A.

(*q*) [*Some have tranſpoſed the Alphabet.*]

How can we otherwiſe think, but this tranſpoſition of Letters (which *Scaliger* calls a Cheat and a Phrenzy) is a meer Vanity, and eaſily to be underſtood even by every Boy. For by obſerving the Force and Power of thoſe Characters, which are often repeated, a Man may eaſily diſcern how little the changing them will conduce to the darkning of a Writing. For to ſecure the ſecret and hidden Senſe from being diſcover'd by the Inquiſitive, it matters not whether a *barbarous* Character, or any other Figure is ſet down or us'd, provided it be known what Language the Paper is written in, and that the Interceptor underſtands it.

(*r*) [*A Third ſort have found out new Characters*, &c.]

This is aſcrib'd to *Cicero*: But now, who can be at the Pains, and not be quite tir'd to find out as many Characters as there are Things in Uſe? And ſuppoſe he ſhould, How in a few Days (not to ſay Hours) will he eaſily forget his Verbal Index?

To conclude this Chapter, theſe Cyphers were invented for *Swiftneſs* in Writing as well as *Secrecy*, that the *Hand* may be as nimble as, nay outrun, the *Thoughts*.

Robertus Vulturius hath *ſwet* very much in this occult Way of Writing, in the 17th Chapter of his 7th Book of the *Art Military*. But *Baptiſta Porta* hath far out ſtript him as to diligence in the Point, in the 16th Book of his Natural *Magick*, to which we ſhall refer the Reader rather than tranſcribe what that Author hath written.

CHAP. XV.

Of Spectacles.

MANY doubt whether the Ancients had *Spectacles* or not, becauſe *Pliny* the moſt diligent of all Writers, hath not ſo much as one Word concerning them.

But however, you will find them mention'd by *Plautus*, when he ſaith [*Vitrum cedo, neceſſe eſt conſpicilio uti*] which cannot be underſtood of any Thing elſe, but of thoſe kind of Glaſſes which are call'd *Spectacles.*

The *COMMENTARY.*

(ſ) [*Spectacles.*]

Conſpicilia: Some ſay, 'tis to be read *Conſpicillum*; as *Baculus*, *Bacillus*; *Furcula*, *Furcilla*; ſo *Speculum*, *Specillum*. Though the Word [*Conſpicilium*] uſed here by our Author, doth commonly denote a Place from whence we may ſee or have a Proſpect of any Thing, as in *Plautus* his *Medic. In conſpicilio adſervabam Pallium*; yet here it ſignifies an Inſtrument which magnifies Objects and makes them bigger.

In which Senſe that of *Plautus* is to be underſtood [*Vitrum cedo, &c.*] ſo that 'tis probable from hence, that they were anciently in Uſe, as it alſo may appear from *Ptolomy*'s Glaſs, (mentioned by *Baptiſta Porta*) by which he ſaw Ships coming 600 Miles off, and whereby we might diſcern our Friends for ſome Miles, and read at a vaſt Diſtance the ſmalleſt Characters. I ſuppoſe *Pancirollus* mentions theſe among new Inventions, becauſe he doth not find them in *Claſſick* Authors.

CHAP. XVI.

Of Saddles, Stirrups, and Horſe-ſhoes.

(*t*) ALL Men believe *Saddles* to be a modern Invention, or at leaſt found out after the *Roman* Empire, in regard we cannot ſee in any ancient *Statues*, that ever Horſes had any Saddles; no, nor in Braſs, nor in any emboſs'd Works of Metals or Stone. But though they were not ſo very ancient, yet we find them in Uſe in the Time of *Conſtantine* the Son of *Conſtantine* the Great, in the Year of our Lord 340. For *Zonaras* tells us, that *Conſtans* in a Battle with his Brother *Conſtantine* about the Diviſion of the Empire, ruſh'd into the middle of his Army, and ſtruck and diſmounted him from his Horſe and Saddle.

Theodoſius Magnus, who began to reign in the Year 382. makes mention alſo of Saddles; for he forbids in a certain Law any Saddle, Bridle, and Portmanteau, to exceed ſixty Pounds Weight in Gold, and that under this Penalty, that whoever tranſgreſs'd in that Particular, ſhould have his Saddle cut in Pieces, and his Portmanteau forfeited.

There is alſo mention made of Saddles in a Conſtitution of *Leo* the Emperor, who began to reign in the Year 472, in which Law he forbids the wearing of Margarites, Emeralds, and other Jewels in their Bridles, or Belts.

Nicetas in the Life of *Andronicus Comnenus* ſpeaks of one *Theodorus*, who alighted from the Saddle of his Horſe, which he calls ἕδρον, *i. e.* the Seat whereon he ſat. And *Zonaras* uſeth the ſame Word for a Saddle in the Life of *Conſtantine Monomachus*, ſo that without all doubt a Saddle was no very ancient Invention.

Neither are we very certain when (*u*) Stirrups were firſt brought into Uſe; but becauſe we find not the leaſt Marks or Foot-ſteps of them, either in Marbles or Brazen Statues, and their Name is not any where extant; it is therefore no Abſurdity to ſay, they were invented after the *Roman* Empire, ſo that it was neceſſary to invent a new Name for a new Thing, ſuch as *Staphia*, *Stapes*, *Stapedes*, *i e.* A Place to ſtay ones Feet on, or a Stay for the Feet.

There are ſome who would have Horſes not to have been ſhod formerly, becauſe Iron Shoes are not to be ſeen on their Statues. The Reaſon of which, I ingenuouſly confeſs, I do not know: But I have read that *Poppæa*, *Nero*'s Lady, ſhod her delicate Steeds with Gold, and the reſt with Silver. A Thing, I preſume, ſhe had never thought of, much leſs practis'd, had they not before been wont to have been ſhod.

Nicetas tells us, towards the end of the Hiſtory, that the *Latins* demoliſh'd a moſt excellent Statue of an Horſe, conſecrated to *Jeſus*, the Son of *Næve*, or as ſome think to *Bellerophon*, and that under the Iron broken off from its Feet, they found the Picture of a Man. And therefore I am apt to believe, that Horſes were ſhod formerly with Iron Shoes.

The *COMMENTARY.*

(*t*) [*All Men look on Saddles to be a new Invention*, &c.]

Pliny ſaith, that the *Pelethronii*, a People of *Theſſaly*, or the *Lapithæ* found out *Frænos* and *Strata Equorum* (*i e.* Harneſs for Horſes) by which Word *Stratum* they underſtood *Ephippia*, or Saddles for Horſes, but inconſiderately; in regard by that Word, not ſo much a Saddle is ſignified, as any Thing elſe that is thrown upon an Horſe; for what ever they ſpread over a Thing was called *Stragulum*, as the Coverlet of a Bed, and ſo *Stratum* is an Horſe-cloth, or a Covering for a Horſe. Becauſe, neither *Pliny*, nor any other Author of Credit do mention thoſe *Ephippia*, or *Sellas Equeſtres*, we are apt to think they were not in uſe among the ancient *Romans.*

Cæſar ſpeaking of the Cuſtoms of the ancient *Suevi*, as different from the *Romans*, ſays, they uſe no *Ephippia* (by which muſt be meant, ſomething that anſwered our Saddles, though perhaps not of the ſame Shape and Form) and that how few ſoever they were, they would not fear to fight with any Number of thoſe that uſed them, *neque eorum moribus turpius quidquam aut inertius habetur, quam ephippiis uti, ne quemvis numerum ephippiatorum equitum quamvis pauci adire audent.* De bello Gall. Lib. 4. Cap. 2.

(*u*) [*Stirrups.*]

Without doubt thoſe Helps whereby we mount the Horſes, and into which we put our Feet for our more eaſy and ſafer Sitting, are but modern Inventions. It is evident from Marbles and Statues, and Triumphal Arches at *Rome*, that the

Ancients did not uſe them, neither doth any Name of them occur in any *Greek* or *Latin* Author. They are commonly call'd *Staffæ*, *Staphiæ*, *Stapedes*, a Stay for the Feet; *Cæl. Rhodiginus* calls them *Subſellares*, becauſe they hung under the Saddle, others call them *Ferra Scanſilia.*

That the Ancients were wont to leap upon their Horſes without the Help of Stirrups, *Virgil* ſhews in the 12th Book of his *Æneids*, and in other Places.

Infrænant alii currus, ac corpora ſaltu
Subjiciunt in equos —— ——

i. e.

" Some mount their Horſes, others ſtrait prepare
" Their Chariots———— .

We find in ſeveral Authors, that this leaping on Horſeback was exactly required not only of *Tyros*, or new raiſed Soldiers, but alſo by the Veterans. They had wooden Horſes within Doors in Winter, and without in Summer. The *Tyros* at firſt vaulted upon them naked and unarmed, but upon their Improvement by Practice, they afterwards mounted them with their Weapons in their Hands. Nay, they were to leap up and down as well on the Left-Side as the Right, and that not without their drawn Swords; ſo that by continual exerciſe, they could in a trice ſkip upon their Horſes with great Dexterity, even in the midſt of the Hurry and Tumult of War, as is evident from *Livy* in the 3d Book of the 2d *Punick* War.

When *Charlemain* had made a certain Presbyter a *Biſhop*, and ſeeing him ſo nimble upon his Advancement, as to leap for Joy upon his Horſe at a Jump, without Bench or Foot-ſtool, or any Thing to aſſiſt him, he call'd to him and ſaid:

“ I ſee, Sir, you are Vigorous and Healthy, “ and by bouncing into your Saddle are a ſpe- “ cial Horſeman, whoſe *Briskneſs* and *Activity* “ would be ſerviceable in the Wars, and there- “ fore I deſire you to leave your *Flock*, and to “ follow the *Army*.

But becauſe this way of leaping on Horſeback, was pretty difficult and troubleſome, eſpecially to thoſe that were infirm and weak, and had no Body to mount them: Therefore the *Viocuri*, *i. e.* the Overſeers (as we call them) of the High-Ways, did all along the Road place certain great Stones, from whence they might eaſily beſtride their Beaſts. *Plutarch* tells us, that *Caius Gracchus* was not only careful in paving the High-Ways, but mark'd out Miles by Stones and Pillars conveniently placed at a meaſured Diſtance, to help poor Travellers to mount their Palfrys, without that Inſtrument made for that Purpoſe; for Stirrups were not in Uſe.

CHAP. XVII.

Of Squaring the Circle.

(*w*) *ARiſtotle* tells us, that there are many Things *knowable*, which are not yet *known*, becauſe the Way or Manner of them is not underſtood; he gives us an Inſtance of *Squaring the Circle*. (*x*) A Thing, which neither he himſelf, nor any one elſe, even to this very Age, could ever do, till about thirty Years ago, when that Art was found out, big with ſome wonderful and mighty Myſtery. The *Greeks* call it a *Tetragoniſm*, which is the (*y*) Reduction of any other Figure to a Circle, which is done after this Manner.

Make a Circle *A. B.* and let the *Diameter* of its *Area* be *A.C.* and 14 Foot long, which Number being trebled, produces 42, to which if you add the 7th Part of the *Diameter*, which is two, there will ariſe 44, for the *Circumference* of a Circle is three Times and a 7th Part greater than the *Diameter*.

Now the *Circumference* and *Diameter* being known, 'tis eaſy to find out the *Area*; for if we divide the *Diameter* by half, *i. e.* by two, there will ariſe 7, and if we divide the *Circumference* alſo by 2, there will be produced 22, which laſt Number multiplied by 7, will give 154, which according to Reaſon in Mathematicks is the *Area* of the Circle.

The Account is this:

The whole Diameter is	14	7 the Quotient.
Its Half	2	
The whole Circumference	44	22 the Quotient.
Its Half	22	

The two Quotients 22 and 7 multiplied together, conſtitute the *Area* of the 154--- thus:

22
7
———
154 the *Area* of the Circle.

It now remains that we find out a Square equal to this, which is done after this Manner:

The *Diameter* being divided (as before) into 14 Parts, a Line is to be drawn from the eleventh Part to the *Circumference*, from the Point *D.* to *F.* ſo that it makes a right *Angle* with the *Diameter*: And then a Line is to be drawn from the laſt Part of the *Diameter* to the ſame Point *F.* and there is made a Line *C. F.* and ſo that *Square* will be equal to the *Circle*; which that you may apprehend to be true, it will be neceſſary to meaſure the Length of the *Square* it ſelf, and therefore the Line *C. D.* is to be meaſur'd, which we ſaid was eleven Foot: That Number multiplied by eleven makes 121, and the Line *D. F.* is to be meaſured and the Length of it you may thus apprehend.

A Line muſt be drawn from the Point (the Centre of the Circle) to *F.* and there will be conſtituted a Triangle *D. E. F.* The Line *E. F.* is equal to the half Diameter, which is 7 Foot, the whole being 14. That Number is to be multiplied by 7, from whence will ariſe 49, from which deduct 15, which is the multiplied Number of the Line *E. D.* which is 4 Foot, which multiply'd make 16; take therefore 16 from 49, and there remains 33, and therefore the Value of the Line *D. F.* will be 33; to which Number join the aforeſaid 121, and the Product will be 154. From whence 'tis evident, that the Value of the Line *F.* doth conſtitute a Square 154, which Number was the *Area* of the Circle.

The *COMMENTARY.*

(*u*) [Ariſtotle *tells us, there are many Things knowable that are not known.*]

He inſtanceth well in the Quadrature of a Circle, a Thing which ſome fancy not as yet known, though perhaps not impoſſible to be underſtood. We may well ſay, that the greateſt Part of thoſe Things we know, is not the Tyth of what we know not. And therefore *Cuſanus* had a Copious Theme, when he wrote a Book of *Learned Ignorance*.

(*x*) [*A Thing which neither himſelf nor any one elſe could ever do*, &c.]

Several great Wits and Mathematical Heads, have been deeply engag'd in this nice Speculation. Among the Ancients before *Ariſtotle*'s Time, *Antiphon* and *Bryſo*, *Hippocrates Chius* and *Euclid*, *Archimedes* and *Apollonius*, *Porus* and others, almoſt crack'd their Noddles in the perveſtigation of this curious Theory. Among the Moderns, *Boetius* and *Campanus*, *Cuſanus* and *Regiomontanus*, *Orontius*, *Finæus*, and ſeveral others, have beat their Brains about this ſubtil Inquiry. If the laſt of theſe could have perform'd as much as he promis'd, he had purchaſed a Wreath of immortal Glory. He is ingeniouſly confuted by *Petr. Nonius* and *Buteon*, who have accurately demonſtrated his vain Attempts as to that Particular.

Hippocrates, a Merchant of *Chios*, being taken by Pyrates, went on Purpoſe to *Athens* to proſecute the Rogues, and during his ſtay there, he fell acquainted with ſome Philoſophers, by whoſe learned Converſe he ſo improv'd in Geometry, that he aim'd at two Things in that Noble Science, *viz.* the *ſquaring* of the Circle, and the *Duplication* of the Cube. As for the *Quadrature* he unhappily miſs'd it, but when he had ſquared a little Half-Moon, he erroneouſly imagined he had ſquar'd a Circle by that. But the fore-mention'd *John Buteon* hath ſhewed in a little Treatiſe the Miſtakes of *Hippocrates*, and alſo of all other Demonſtrations about this Matter. And *Ramus* in the 1ſt Book of his *Scholar. Mathemat.* and in the 19th of his *Geometry* hath ſomewhat extant upon this Subject.

Boetius and *Iamblicus*, the one in his Comment on the Category of *Relation*, and the other in his Paraphraſe of the *Ten Prædicaments*, affirm the Invention of the *Tetragoniſm* we are ſpeaking of, as *Simplicius* informs us in his Notes on the 1ſt Book of *Ariſtot. Phyſicks.* And the ſame Author tells us, that this *Quadrature* was found out by *Sextus*, *Pythagoras*, and *Archimedes*, by *Apollonius* and *Nicomedes*, by *Cartes* and others: But many deny that there was ever any ſuch Thing, ſo that the Point in Hand ſeems very uncertain. And really the fruitleſs Study of the acuteſt Mathematicians in all Ages engag'd in the Reſearch of this notable Difficulty or perplex'd Abſurdity, hath driven the Learned into a fit of Deſpair; ſo that they are quite Hopeleſs that ever Poſterity will be bleſs'd with ſo rare an Invention. And yet ſome think, that the Thing is *poſſible* and *knowable*, though it is not as yet found out and diſcover'd.

All that we ſhall add concerning this intricate and confounding *Problem*, in ſhort is this: That according to the Doctrine of *Ariſtotle*'s School, which holds a *Continuum* to be infinitely diviſible, the Thing is deſperate and impoſſible to be done, becauſe a ſtrait Line and a Circle can never be equal, as that *Philoſopher* teacheth in the 7th Book of his *Phyſicks*: But upon the admiſſion of the *Corpuſcular Hypotheſis*, holding all Things to be made and compoſed of Atoms, and Lines to conſiſt of indiviſible Points; I ſay, upon the Allowance of this modern Opinion, this Difficulty we are upon, ſeems not only ſuperable, but very feaſible; as *John Schuler*, Profeſſor at *Breda*, ingeniouſly ſhews in his *Phyſiological Exercitations*, to which we refer the curious Reader.

(*y*) [*'Tis the Reduction of any Figure to a Circle, which is done thus.*]

The Knot and Difficulty of this Queſtion, lies in the Proportion which the Diameter and Circumference have to each other. *Pancirollus* induſtriouſly explains it in this Chapter, wherein you have ſet down the Demonſtration at large.

And indeed the exact Proportion betwixt theſe two, being the Ground of the *Quadrature* of a Circle, is a Matter which hath ſet at Work the great Wits of the World, and yet notwithſtanding their painful Diſquiſition, it lies ſtill in the Dark, and is not diſcover'd; inſomuch, that *Pitiſcus* and other eminent Mathematicians, might very well doubt whether it would ever come to light.

Aurantius Vinetus formerly, and *Joſeph Scaliger* of late, wrote a Book, wherein he would prove and demonſtrate, that he had found out the exact Proportion between the Diameter and Circumference. But he was much deceived, and therefore was confuted by the Profeſſor at *Heidelberg* and by others, who prove it impoſſible that there ſhould be an exact Proportion betwixt them.

The Invention of this, would conduce much to the clearing up of many Obſcurities and cloudy Places in *Ariſtotle*; and would be of infinite Uſe in Mathematicks, in Architecture, and in the meaſuring of all round Bodies, as Globes, Veſſels, *&c.* inſomuch, that from the Sight either of their Bottom or Cover, a Man may ſoon underſtand the whole Method of framing them from this Doctrine, that ſhews the Proportion betwixt the Diameter and Circumference; which teacheth us no more than this, (which indeed is the grand Query) how many Times a ſtrait Line drawn through the Centre of a Circle, is contained in the Circumference; or how much a Circular or Circumferential Line is greater than a ſtrait Line drawn through the Centre or Middle of a Circle.

CHAP. XVIII.

Of Mural or Wall-Engines and Guns.

(z) THE Military Inſtruments called Guns, were found out by a *German* about the Year of our Lord 1378. They were firſt uſed by (*a*) the *Venetians* in an Engagement with the *Genoeſe* at *Foſſa Clodia*, which Place the *Genoeſe* had a Deſign to reduce, and to bring under their Yoke without regard to any Conditions of Peace. But being ſtrangly mawled, weaken'd and worſted by theſe War-like Engines, they were almoſt all deſtroy'd.

(*b*) They were call'd *Bombardæ*, from the bombous kind of Noiſe they make; from hence was found out thoſe *Hand-Guns*, which fir'd by a Match or by the Knack of a *Wheel-Lock*, do ſhoot Bullets. Theſe are daily in Uſe, and therefore 'tis needleſs to inſiſt any longer upon them, and alſo to ſpeak about Gun-Powder made for that Purpoſe.

(*c*) The *Latin* Word [*Sclopus*] is deriv'd from the Sound, which breaks out at the firing of them, according to that of *Perſius*,

Nec Sclopo tumidas intendis rumpere buccas.
---- " Nor doſt thou ſtrive to ſtuff
" Thy ſwelling Cheeks, to break them with
a Puff.

Which Verſe is to be underſtood of that Sound which I mention'd, and not of the Noiſe of Guns, which were not in being at that Time.

The *COMMENTARY.*

(*z*) [*Guns were firſt invented by a* German,&c.] All Hiſtories do agree in this, that a *German* was Author of this Invention, but whether his Name be known, or whether he was a Monk of *Friburg*, *Conſtantine Ancklitzen*, or *Bertholdus Swartz* (as ſome call him) a Monaſtick too, is not ſo very certain. 'Tis ſaid he was a Chymiſt, who ſometimes for Medicines kept Powder of Sulphur in a Mortar, which he covered with a Stone. But it happened one Day as he was ſtriking Fire, that a Spark accidentally falling into it, brake out into a Flame, and heav'd up the Stone. The Man being inſtructed by this Contingency, and having made an Iron Pipe or Tube together with Powder, is ſaid to have invented this Engine: So that Fortune made him the Author of that which he never dream'd of; juſt as *Diocles* the *Athenian* was of Muſick, by ſtriking with his Stick ſome earthen Veſſels; ſo true is that of *Aratus* [*That* Jupiter *teacheth not*

Men all Things at once] There are many Things lie concealed which he will diſcover to Poſterity. Nature hath a vaſt Treaſure of Knowledge, which cannot be exhauſted in all Ages.

Some aſcribe the Invention of Guns to *Archimedes*, at the Siege of *Syracuſe* by *Marcellus*; either to defend the Liberty of the Citizens, or to defer and prorogue the Deſtruction of his Country. We wonder why they do not commend as Founder of them *Demetrius* King of *Macedon*, whoſe ingenious Contrivance of Military Engines dubb'd him Πολιορκητῆς; and whoſe elaborate Machine he batter'd the *Cilicians* with, was ſo admired by *Lyſimachus*, that for that very Thing he ſtyl'd him *Divine Demetrius.*

Some Writers of the *Indian Hiſtory* tell us, that *Guns* as well as *Printing* were found out by the *Chineſe* many Ages ago. They ſay alſo, that they were in Uſe among the *Moors* long before they were known in *Germany:* But how is it poſſible or credible, that an Inſtrument ſo neceſſary for the beſieged to repel the Attacks of their Enemies, ſhould lie dormant ſo long? Whereas, as ſoon as ever the Uſe of *Guns* was known to the *Venetians*, and *Printing* to the *Romans*, it was preſently communicated to other People, ſo that now nothing is more common throughout the World.

But methinks they are very ridiculous, who make *Salmoneus* the Founder of this Art of Gunnery from thoſe Verſes of *Virgil* in his 6th *Æneid.*

------ Crudeles dantem Salmonea pœnas
Dum flammas Jovis, & ſonitus imitatur Olympi:
Demens, qui nimbos, & non imitabile fulmen
Ære & cornipedum curſu ſimulabat equorum,

i. e.

Salmoneus, ſuff'ring cruel Pains, I found,
For emulating *Jove*: The rattling Sound
Of mimick Thunder, and the glitt'ring Blaze
Of pointed Light'nings, and their forky Rays:
Ambitious Fool, with horny Hoofs to paſs
O'er hollow Arches of reſounding Braſs;
To rival Thunder in its rapid Courſe;
And imitate inimitable Force.

For 'tis clear and evident, from that ſpark of Poetry that *Salmoneus*'s Machine was an harmleſs Engine, nothing but a Scare-Crow to affright and ſtrike into a Panick Fear; and therefore in no wiſe to be compared or equal'd to Thunder, except in its empty Noiſe and Fragor.

We may here (not impertinently) for the Diverſion of the Reader, draw a Parallel betwixt Guns and Thunder, and compare them together in ſeveral Reſpects, but we pretend not to Exactneſs in every Particular.

The Report of a Cannon is not only like Thunder in Sound and Fire, in the Blow and Effects, but infinitely excels and goes beyond it. For Thunder ſometimes is ſo kind an Artillery, as to ſpare Mens Lives; but theſe barbarous Engines do always Sacrifice them to their horrid Cruelty. Thunder oftentimes with a caſual Stroke ſtrikes inanimate Creatures, and ſeldom ſlaughters a rational Being; but Guns chiefly aim at Man's Deſtruction.

Beſides, many Remedies are preſcribed by Authors againſt Thunder; as Caves in the Earth, and Crowns of Laurel, the Skin of Sea-Calves, and Eagles Feathers, all which are Proof againſt Heaven's Arſenal: But no Rampire or Bulwark is impregnable againſt the Batteries of an Earthly Magazine. If thoſe vain Superſtitions are Preſervatives againſt natural, yet they are no *Taliſmans* againſt artificial Canons. The Noiſe of Bells can diſperſe, rarify, and melt (as it were) the cloudy Barrels of thoſe celeſtial Mortar-Pieces: But what Violence (I wonder) can break the Force of theſe terreſtrial Granado's? A Peal of Thunder gives but a ſingle Stroke, it picks and choſeth, as it were, and aims but at one Mark: But a Volley of Shot gives a numerous Blow, it levels at many, and ſcatters Fate.

Thunder ſends its Harbingers, a Crack, and Lightning, the Fore-runners of its Miſchiefs: But Guns give Fire and go off, at the ſame Inſtant; they ſmite and make a Noiſe, make a Noiſe and ſmite, and will at the ſame Time ſalute your Ear with a ſound, and your Back with a Bullet.

Laſtly, there are ſome cooler Climates and Seaſons, as Northern Regions and Winter-Weather, whoſe too great Rigours extinguiſh the Heat; and there are hotter Countries and Times, as *Egypt*, and the Summer, whoſe intenſe Heat ſcatters and melts all frigid Vapours; ſo that there is no colliſion of Clouds, and conſequently no Thunder. But now theſe metallick Inſtruments abound every where, and at all Times and Places can produce their diſmal and miſchievous Effects. And therefore ſeeing Guns do not only imitate, but exceed all Thunder, it is impoſſible *Salmoneus* ſhould be the Author of them, in regard the Poet tells us, he did counterfeit inimitable Thunder.

But though Envy cannot rob the *Germans* of this Invention, yet it damns the Author to the loweſt Shades. A juſt Doom pronounc'd againſt a Fellow born only for the Deſtruction of Mankind. Certainly, no Humane Wit, but ſome malicious Fiend, muſt ſuggeſt to Mortals ſo fatal an Air. It had been no Matter, if (*Perillus*-like) he had handſell'd the Experiment of his ingenious Cruelty.

But though nothing is more miſchievous than thoſe pernicious Machines to a beleaguer'd Fortreſs, yet what is more commodious to a Town beſieg'd, whoſe miſſile Fire, or fiery Miſſives beat off the Enemy from attacking their Works? For indeed, what Civility hath Nature done at any Time to any Man, without the unhappy Attendance of ſome *Diſcourteſy*? Speak Fire and Water! Ye great Preſervers of Humane Life, and ye moſt barbarous Deſtroyers of Mankind! But perhaps Heaven hath in Judgment inflicted the Cruelty of this Invention, on purpoſe to fright Men into Amity and Peace, and into an Abhorrence of the Tumult and Inhumanity of War.

(*a*) [*Firſt uſed by the* Venetians, &c.]

About the Year of our Lord 1380. in a Fight againſt the *Genoeſe*, who perceiv'd the Deſtruction made among their Troops, but ſaw not the Inſtruments that caus'd it. And ſince Wars are not wag'd by Laws and Covenants or civil Compacts, let every one endeavour, either by Strength or Policy, to kill his Enemy as well as he can.

Some are of Opinion, that Slings, formerly us'd, had greater Force, and did more Execution than Guns; which, though they are very pernicious, yet Experience tells us, are not always victorious; wherefore a certain Captain told the Duke of *Savoy*: *That he was wont to uſe his Musket for Shew, and not for Neceſſity, and that after the firſt Attack of the Enemy they threw them away, and conquered with their Swords, which were moſt ſucceſsful.* *Henry* IV. of *France* had Experience of this in ſeveral Conflicts, whoſe Blades were laden with frequent Triumphs.

What ſaid the *Laconian* when wounded with a Dart? *I am not*, quoth he, *concerned at my Death, but at my Fall by a Wound from a feeble Archer*.. For 'tis Satisfaction to the Vanquiſh'd, to expire by the Hand of Heroick Valour; hence that of *Virgil*:

Æneæ magni dextra cadis ------

" 'Tis by the Great *Æneas*'s Hand you fall."

And becauſe the *Lacedæmonians* were wont to grapple with their Swords, 'twas not counted Bravery to kill a Man with a Dart; a Thing that may be done by the ſillieſt Woman.

(*b*) [*Bombardæ.*]

A Bombo, which ſignifies an humming kind of Noiſe, q. *Bombizatio quædam ardens*; a kind of burning Bombization.

(*c*) [*Sclopus*, &c.]

There are ſeveral Sorts (you ſee) of theſe *Bombardæ*: *Sclopeti* are thoſe Muskets which the Infantry carry, called by ſome *Harque Buſſes*, i. e. *Arcus Buſius*, from *Arcus* a Bow, (whoſe

Room it ſupplies in a Battle; for as Archers were formerly in the Front, ſo *Muſketeers* are now,) and *Buſio*, which in *Italian* ſignifies a Hole, becauſe the Fire enters through an Orifice into the Barrel of the Gun, and there kindling the Powder diſchargeth the Bullet.

CHAP. XIX.

Of Greek Fire, commonly call'd Wild-Fire.

IN the Reign of *Conſtantinus Pogonatus* (*i. e.* of bearded *Conſtantine*) there was found out (*d*) an Art to kindle Fire under Water, and this was call'd *Greek Fire*, becauſe the Inventor of it was *Callinicus* a *Greek*, in the Year of our Lord 680. (*e*) *Conſtantine* defended himſelf in a Sea-Fight againſt the *Saracens* with this Fire, brought from *Conſtantinople*, as *Zonaras* in his Life informs us.

The *COMMENTARY.*

(*d*) [*An Art to kindle Fire under Water*, &c.] Though 'twas uſual with the Ancients to make Balls, which would be fired with Rain, and which being caſt into Rivers, would burn and conſume even Bridges and Navies; and though they call'd theſe *Greek Fire*, and aſcrib'd the Invention to *Marcus Gracchus*; yet that which we properly call *Greek Fire* is of another Nature; the Author of which was one *Callinicus*, who flying from *Heliopolis*, taught it the *Roman* Emperors.

'Twas done after this manner; they boil'd together the Coals of Willow and Salt, *Aqua-vitæ* and Sulphur, Pitch and Frankincenſe, Camphire, *&c.* All which will burn under Water, and any of them will conſume any Subſtance or Matter whatſoever.

(e) [Conſtantine *defended himſelf with it.*] When a Navy of *Saracens* came up to *Byzantium*, and were repuls'd from thence, they went to *Cyzicum*, where ſtaying about the ſpace of ſeven Years, they often engag'd at *Byzantium*, until Fire kindled under Water by the Art of *Callinicus*, burnt the Ships of the *Saracens*, ſo that great Numbers being ſlaughter'd, the reſt were forc'd to fly. And by this Device the *Saracens* (doubtleſs) ſuffer'd a greater Loſs than the People of *Syracuſe*, when *Archimedes* by his Burning-Glaſſes weaken'd their Strength by ſo great a Diſappointment.

Others have made uſe alſo of this *Greek Fire*, among whom chiefly the Emperor *Leo*; for when the *Eaſtern* People came in an hoſtile manner againſt the City of *Conſtantinople* with a Fleet of 1800 Veſſels, the Emperor directing his Fire-ſhips againſt them, burnt them all with this kind of Fire.

CHAP. XX.

Of Juſts, Tournaments, or Tilting.

JUSTS or [*b*] Tournaments, thoſe *ludicrous* Repreſentations of a counterfeit War, were firſt in-

invented by *Manuel Comnenus*, Emperor of *Conſtantinople*, as *Nicetas* informs us, who wrote to the Year 1214. Before his Time we do not find that that Exerciſe was in uſe in the *Roman* Empire; which, as 'tis a Tryal of Strength and Valour, ſo it is a Sport full of Hazard and Danger, in regard it hath been fatal to ſeveral Perſons. The Fall of King *Henry* is very famous, and well known in the World.

I my ſelf have ſeen many who have been mutually the Death of each other; and therefore *Gemes*, the Brother of the Sultan *Selimus*, being ask'd by Pope *Alexander*, after much dry baſting, how he liked theſe ſportive *Velitations*, made anſwer, If this drubbing be in *earneſt* (moſt holy Father!) it is too little, but if it is in *jeſt*, it may be too much.

Nicetas mentions in his third Book, that pompous Tournament exhibited by *Manuel Comnenus* to the Latins at *Antioch*; for when theſe being about to poſſeſs the Holy Land, ſhew'd their Gallantry in Horſemanſhip, and at the Lance: *Manuel*, willing to let them ſee that the *Greeks* were no way inferior, nor would yield to the *Latins*, pitch'd upon a Day for *Juſting* and *Tilting*, but with blunt Spears; and therefore he appear'd in his Imperial Robes, gloriouſly attended with well-appointed *Greeks*, and diſmounting a Brace of *Latins*, he laid them flat on the Ground.

The *COMMENTARY.*

(h) [*Tournaments.*]

A very late Traveller tells us that he ſaw at *Bologne*, formerly that Exerciſe of *Juſting* and *Tilting*, which is ſtill us'd there in Carnival

Time. He deſcribes it thus. The Combatants being mounted on Horſeback, and arm'd *Cap-a-pe*, and adorn'd with huge Plumes of Feathers and Scarfs, with Lances in their Hands, run at one another a full Gallop, one on one ſide, and another on the other ſide, of a low Rail; they aim at one particular Part (I think the Eye) and he that comes the neareſt is the beſt *Juſter*.

This kind of Exerciſe was a perfect Image and Reſemblance of a Duel, which way of contending muſt needs be the Invention of the *Stygian* Tyrant, who is ever embroiling the World in Wars. And therefore (doubtleſs) this manner of *Digladiation* was very ancient; ſuch was the Skirmiſh we read of in the Poet *Horace*.

——————*Quod incidit inter*
Hectora Priamidem, animoſum atq; inter Achillem:
Ira fuit capitalis, ut ultima divideret Mors,
Non aliam ob cauſam, niſi quod virtus in utroque
Summa fuit --------
" So valiant *Hector*, when he did engage
" 'Gainſt ſtout *Achilles*, ſuch a deadly Rage
" Did animate them both, that nothing cou'd
" Satiate their Fury, but each other's Blood;
" And Death of one, merely 'cauſe both were ſtout,
" Conquer or dye both could, but ne'er give out.

Thus *Scipio Africanus* is highly celebrated for killing a *Barbarian* in *Spain* in a ſingle Combat. And whoever diſcommended *Alexander* the Great, for *tapping* the Breaſt of *Spithrobates*, the Governour of *Ionia*, with his Spear, when they were engaged in a Duel?

All *Monomachy* is forbidden by the Bulls of the Popes, eſpecially of Pope *Nicholas*, being a Temptation of Heaven, ſince the innocent Party may, in the juſteſt Quarrel, be baſely murder'd, and the moſt guilty Miſcreant may conquer in the Encounter. And therefore what is a Duel, but a furious Redreſs againſt the Laws of Nature, a brutal Rage, rather than a Fit of human Madneſs? But *Frotho*, a *Daniſh* King, was of another Mind, who publickly enacted, that all Quarrels and Diſputes ſhould be decided by the *Sword*; for he thought it more ſeemly for Men to try their Strength by mutual Blows, than to *ſcold* out the Difference in *Billinſgate* Words.

CHAP. XXI.

Of a Quintane.

THE uſe of a (*a*) *Quintane* is ancient enough. It was appointed for *Exerciſe*, and not for *Sport*. The *Romans* made in their Camps four Ways, reſembling a Croſs, to theſe they ſubjoin'd another, which, becauſe it was a fifth, was called *Quintana*, as *Vegetius* informs us. In this Way they (*b*) faſtned in the Earth a great Stake, (*c*) about which the Soldiers exercis'd, as if it had been a Man. And this Exerciſe they call'd [*Ad Palum.*] But now our Countrymen have chang'd it from an *Exerciſe* to a Matter of *Pleaſure*, fixing a Stake in the Earth, and cloathing it like a Man, which ſtill retains the Name of a *Quintane*, from *Via Quintana*, wherein the Soldiers were exercis'd.

The *COMMENTARY.*

(*a*) [*Quintana.*]

So ſtyl'd (it ſeems) from a Way of that Name. 'Tis call'd alſo *Exercitatio ad Palum*, and ſometimes *Palaria*, which Exerciſe anciently was a fencing at a Stake or Poſt fix'd in the Ground, but appearing above it the height of a Man, ſix Foot; (as *Vegetius* deſcribes it) at which they perform'd all the Points of the Fencer's Art, as with an Enemy, by way of Preparation to a true Fight.

(*b*) [*Faſten'd a Stake in the Earth*, &c.]

That is, ſo firmly, as not to ſhake or totter, and to be higher than a Man about ſix Foot. The *Tyro's*, or Freſh-water Soldiers, were wont *nigh at hand*, to make at this Poſt with their Clubs or Swords, as if it had been an Enemy; but at a *Diſtance* they threw at it, and hit it, and all for a Readineſs and a greater *Dexterity* in a real Battel. But they were very cautious of expoſing themſelves in attacking the Stake, and were as careful in avoiding as in giving of Blows. Every *Tyro* had a particular Stake, which he encounter'd as an Enemy, aiming ſometimes at the Head, and ſometimes at the Face, *&c.* and making Proffers to hit it ſometimes on this ſide, and ſometimes on that, *q. d. Here I could have you, and there I could have you*, with a great deal of Facility, and with the turn of a Hand. *Juvenal* alludes to this Exerciſe in his 6th Satyr.

------ *Aut quis non videt vulnera pali,*
Quem cavat aſſiduis ſudibus ſcutoque laceſſit,
Atque omnes implet numeros? ------ i. e.

“ Who knows and ſees not how with Spear
and Shield,
“ The wounded Poſt is charg'd by Maids at
Arms,
“ And rarely-well-train'd Matrons, whoſe
Alarms ------

(*c*) [*About which the Soldiers exercis'd.*]

Military Diſcipline (like other Arts) is improved by Uſe, and loſeth its Vigour by nothing more than by Sloth and Luxury: Let Soldiers do any thing, rather than lie melting in Idleneſs and Pleaſures; Valour will ruſt, unleſs furbiſh'd up with a brisk Adverſary, and Courage languiſh, unleſs quickned and reviv'd by ſharp Encounters.

Softneſs and Eaſe are the very *Bane* of Nations; and therefore when ſome cry'd out, *That the Roman Affairs were ſafe and happy, through the Fall and Reduction of the Carthaginians and Græcians. Scipio Naſica* made anſwer, *We are now in the greateſt Jeopardy and Danger, in regard we have no body either to fear or revere.* It was a deſerv'd Encomium which *Æmilius Probus* gave of *Iphicrates.* viz. *That no Man in* Greece *had an Army better diſciplin'd than he had.* And King *Philip* advanc'd and ennobled (as it were) the Meanneſs of *Macedon* into its Majeſty and Grandeur, by no other Means than a frequent and diligent training of his Soldiers.

The *Romans* had their *Campi-Doctores, i. e.* Inſtructors of their Warriours in the Art of Fighting, teaching them how curiouſly to make, and to avoid a Paſs, and how, either at *Sharps* or *Foins* dextrouſly to hit a Man. Their *Tyro's* or Novices were train'd alſo in running and leaping, and were not only ſhew'd and learn'd how to ſhoot, but to manage a Horſe, and to paſs Rivers, to ſcale Walls, and to climb Works, to keep their Ranks, and to wheel about, and to do many other Feats relating to War and Martial Affairs; and all this they acted (as we do at our Muſters) in counterfeit Skirmiſhes, and in the Shew of a Battel; according to that of *Virgil* in the ſeventh Book of his *Æneids.*

Ante urbem Pueri primævo flore juventus
Exercentur equis, domitantque in pulvere currus,
Aut acres tendunt arcus, aut lenta lacertis
Spicula contorquent, curſuque ictuque laceſſunt.

i. e.

--------- " Without the Gate,
" They ſee the Boys and Latian Youth debate
" The Martial Prizes on the duſty Plain;
" Some drive the Cars, and ſome the Courſers rein:
" Some bend the ſtubborn Bow for Victory,
" And ſome with Darts their active Sinews try.

The Soldiers alſo learn'd how to carry their Arms and Baggage in a March, to which *Virgil* alludes in the third Book of his Georgicks.

Non ſecus ac patriis acer Romanus in armis,
Injuſto ſub faſce viam cum carpit & hoſtem
Ante expectatum poſitis ſtat in agmine caſtris.

i. e.

" Thus, under heavy Arms, the Youth of *Rome*,
" Their long laborious Marches overcome;
" Chearly their tedious Travels undergo,
" And pitch their ſudden Camp before the Foe.

A Target and a Sword, a Bow and an Helmet, are no more Burden to a good Soldier than his Arms and Shoulders; ſor his Weapons are his Limbs, which he carries ſo dextrouſly, that upon an Occaſion he can uſe them as readily as he can his Joints.

CHAP. XXII.

Of Mills.

PRocopius tells us that *Beliſarius*, *Juſtinian*'s General, being beſieg'd by the *Goths* at *Rome*, found out the way of grinding Corn by (d) *Mills* mov'd by Water.

Pliny, in the tenth Chapter of his eighteenth Book, makes mention of Wheels turn'd by the Current of Water; but I ſuppoſe that Uſe was diſcontinu'd and laid aſide, and afterward was reviv'd again by *Beliſarius*.

The COMMENTARY.

(d) [*Mills.*]

Molæ, in Latin *a molendo*, from grinding, or (as ſome think) *a molliendo*, from ſoftning, becauſe whatever is caſt into 'em is mollify'd by them. Thoſe that are turn'd about with Water, are call'd Water-Mills, which, whether they were known to the old *Romans* or not, is a Queſtion. Some are of Opinion that they were not in uſe among the Ancients, becauſe they *burnt* their Grain, and pounded it in Mortars; hence that of *Virgil* in the firſt of his *Æneids.*

------------ Frugeſque receptas,
Et torrere parant flammis, & frangere ſaxo.
" Some dry their Corn infected with the Brine,
" Then pound with Pebbles, and prepare to dine.

They firſt dry'd their moiſt Corn, and then caſt it into a Mortar, and ſo beat it; and they were call'd *Pinſores* formerly, who are now call'd *Piſtores.* So we find that *Jove, à Pinſendo,* was call'd *Piſtor*; for when the *Gauls* beſieg'd the Capitol, an Altar was erected to *Jupiter Piſtor,* becauſe he adviſ'd the *Roman* Deities to make Bread of all they had, and to throw it into the Enemy's Camp; which when it was done, the Siege was raiſ'd, the *Gauls* utterly deſpairing of ſtarving and ſubduing the *Romans* by Want. Thus in like manner thoſe Feſtival Holy-days, which were appointed for burning their Corn, were call'd *Fornicalia,* becauſe the Sacrifice was perform'd *ad Fornicem,* which was in the grinding or Bake-houſe.

Afterward Mills, or *Verſatile,* or *Truſatile* Engines were found out, which were turn'd about either by Men or Beaſts, but with very great Toil and Labour.

And hence it is that *Piſtrinum (a Pinſendo,* from pounding, for before the uſe of Mills they pounded their Corn in Mortars, the Place where they did it being call'd *Piſtrinum)* is put for a Place of Work, a *Little-Eaſe,* an Houſe of Correction or *Bridewel*; for criminal Servants were condemn'd *ad Piſtrina,* to the Mill-houſe, and were doom'd to the perpetual Servitude of turning a Mill.

We find alſo that after the manner of thoſe *Fornicalia*, certain *Veſtal* Rites were inſtituted, which were ſolemniz'd with Feaſts; at which Meat was ſent by the Citizens to the *Veſtal* Virgins, to be offer'd to the Goddeſs *Veſta*, and crown'd Aſſes, carrying (as it were) Bracelets of Bread, were led about the City; nay, the very *Mills* were adorn'd with Flowers and Garlands, and ſtood ſtill. The reaſon of which Ceremonies we find in *Ovid* to be, that having no Mills, they were wont to burn their Corn in Ovens by the help of *Veſta*, *i. e.* Fire. And hence it is that Fire, or *Domina Focorum*, i. e. *Veſta*, were worſhipp'd by Bakers, and that Aſſes, which by reaſon of Fire, or through the help of *Veſta*, were excus'd from the *Mills*, and being at leiſure, kept Holy-day. And the ſame Author tells us, that the reaſon why Aſſes were crown'd, and had Collars of Bread about their Necks, was becauſe *Veſta* being rowz'd from Sleep by the braying of *Silenus* 's Aſs, eſcap'd the Snares and Luſt of *Priapus*.

But notwithſtanding all this, *Procopius* tells us that Mills were made at *Rome* on the *Tyber* to grind withal, becauſe (he ſaith) there was a great quantity of Water, which running into a Creek, ruſh'd with Violence through the Chanel, wherefore the ancient *Romans* ſeem'd to compaſs the Hill *Janiculus* with a Wall, to prevent a Paſſage at the Mills for the Enemy; ſo that 'tis probable from hence there was the uſe of Water-mills, but it might be laid aſide (as *Pancirollus* ſaith) for a Time, and afterward be reviv'd and introduc'd again.

The occaſion of the Invention of *Mills*, may be taken (I ſuppoſe) from thoſe *natural ones*, which every one carries in his Mouth; for who is not dextrous at the bruiſing of a Cruſt by vertue of his *Grinders*, unleſs ſome toothleſs old Grandame, who being forc'd to make *Mill-ſtones* of her Gums, can only mumble the *Griſt* of a little ſoft Pudding. Some body (doubtleſs) obſerving the Attrition of his Teeth, laid one rough Stone upon another, which rubbing together, cruſh'd the Grain into Duſt and Powder.

CHAP. XXIII.

Of Hawking.

THey were wont formerly to go a *Fowling* with Nets, and not with rapacious *Animals*, ſuch as Hawks, Falcons, and the like; a Thing which was altogether unknown to the Ancients, as *Jovius Blondinus* writes in the ſecond Book of his Hiſtory of *Muſcovy*. *Frederick Barbaroſſa*, when he beſieg'd *Rome*, is thought to have invented this way of Hawking, which as 'tis moſt profitable, ſo 'tis alſo now moſt in uſe.

The COMMENTARY.

Hawking was utterly *unknown* to the Ancients, being very *rarely*, if ever, mention'd by any ancient Author. But here we muſt underſtand very hoary Antiquity, otherwiſe we find in Hiſtory, and it appears by *Julius Firmicus*, Book 5. Chap. 2. that it was known 1200 Years ſince, where mention is made of Breeders and Feeders of Hawks, of Falconers and Falcons, and other Fowling Birds.

There have been many who have written on this Art, as *Frederick*, the ſecond, Emperor of *Germany*, the Son of *Henry*, and Nephew to *Frederick Barbaroſſa*, hath written two Book of *Falconry*, ſingular Monuments of his excellent Learning. They were publiſh'd at *Avsburg*, from his own Manuſcript, and were kept in the Library there; from whence *Joachim Camerarius*, a Phyſician, took it and printed it at *Norimberg*, together with *Albertus Magnus*'s Treatiſe of Hawks and Falcons, which he annex'd to it.

Budæus alſo hath written a large Diſcourſe of Hunting and Hawking, part whereof is annex'd to the latter end of *Hen. Eſtienne*'s French and Latin Dictionary; in Italian, *Oliva*; in Engliſh, *Markham*, *Latham* and *Turbevil*, whom Mr. *Ray* hath epitomiz'd.

CHAP. XXIV.

Of Woven Silks, or Silken Webs.

(e) SIlk was formerly brought from the People call'd *Seres*, whoſe Country is now nam'd *China*. *Procopius* tells us, that in the Reign of *Juſtinian*, about the Year of our Lord 550, (f) certain Monks brought Silk-worms from *Conſtantinople*, and from thence began the Art of making thoſe Webs in *Europe*.

About 50 Years ago, there was ſuch Plenty of them in the *Venetian* Territory, that they got yearly by them 500000 Crowns, and my Country (which is *Rhezzo*) 100000, and *Sicily* a great deal more; ſo that, in a word, this Art or Manufacture, was the only Nerve and Sinew (as it were) of the Merchants Gain, and the ſureſt

Support to thoſe that were Operators and wrought in it.

There are Silks made now a days altogether unknown to the Ancients, ſuch as *Ungulata*, which becauſe invented at *Damaſcus*, are call'd *Damaſcena*, Damasks; *Holoſerica villoſa*, Velvet, ſo called from its Roughneſs like Hair, which the Latins call *Villis Raſa*, *ſemiraſa*, perhaps Sattin; *Ormeſina*, from *Ormus*, an Iſle in the *Perſian* Gulph, and ſeveral other Sorts, a Catalogue whereof would perhaps ſeem tedious.

I ſuppoſe moſt of theſe were unknown to the Ancients, and for want of Silk-worms were not made by them. *Lampridius* tells us, that *Alexander Severus* never wore any Garment of Velvet, which we now ſee daily *tatter'd* into Jags, even by the meaner ſort. And *Vopiſcus* writes, that *Aurelian* had never any Veſtment of *clean* Silk, neither would he ſuffer any Man to wear them, or to have them in their Wardrobes. Nay, when his Wife ask'd him leave to wear a Gown of Purple Silk, he made her this Anſwer, That he would never ſuffer Thread to be weigh'd againſt Gold for at that time a Pound of Silk was repay'd again in a Pound of that Metal.

The *COMMENTARY.*

(*e*) [*Silk was brought from* China.]

Becauſe they were famous for *kembing* ſilken Fleeces made of Leaves by Worms, according to that of *Virgil* in the ſecond Book of his *Georg.*

Quid nemora Æthiopum molli canentia lana,
Velleraque ut foliis depectant tenuia Seres. i. e.

" The green *Egyptian* Thorn, for Med'cine good,
" With *Ethiop* s hoary Trees and woolly Wood,
" Let others tell; and how the *Seres* ſpin
" Their fleecy Foreſts in a ſlender Twine.

i.e. By the working of Silk-Worms. In *Taprobane*, Silk made by Worms is gather'd from Trees; but in *China* 'tis ſo plentiful, that Silks are as common there, as the cheapeſt kind of Linen is here among us.

Silken Garments, now call'd *Serica*, from the People *Seres*, were formerly call'd *Medica*; becauſe (I preſume) they were brought from the *Medes* and *Perſians*, until the Emperor *Juſtinian* ſent an Embaſſador to the King of *Æthiopia* to aſſiſt him againſt the *Perſians*, to the end that the *Æthiopians* might enrich themſelves by trafficking in *Indian* Silk, and by ſending it to *Rome*.

(*f*) [*Certain Monks brought Silk-Worms to* Conſtantinople.]

So that then there was great Increaſe of this Commodity in *Europe*, after that theſe Perſons had brought a Seminary to *Byzantium*, and declar'd its Original, how theſe Worms proceed from little Eggs, and are nouriſh'd by Mulberry Leafs.

[*Moſt of theſe kinds of Silks were unknown to the Ancients for want of Silk-worms.*]

Galen ſpeaks of the Rarity of Silk in his Time, how it was only to be found at *Rome*, and that only among the rich, and the better Sort. This Scarcity is aſcrib'd to the Want of Mulberry-Trees, which is the uſual Food that that *Inſect* feeds on.

CHAP.

CHAP. XXV.

Of Botargo *and* Caviare.

IT remains now that we ſay ſomewhat of ſome Things relating to eating and the Palate, and to oppoſe thoſe Liquids of *Botargo* and *Caviare*, to the *Garum* and *Muria* of the Ancients, which, though unworthy the Cognizance of your Gravity and Highneſs, yet it may not be improper, for the Advancement of our Knowledge, to conſider a little as well as the former.

Botargo is made of the Eggs of the Fiſh *Cephalus* (which the Latins call *Mugil*, *i. e.* a Mullet) mingled with Salt, and the Blood of the ſame Fiſh. 'Tis call'd corruptly by the Moderns, *Botarcha*, *q. d.* ὠοτάριχα, that is, *Ova ſalita*, ſalted Eggs. They are in ſo great Eſteem, that a Pair of them was ſold at *Venice* for four Crowns.

In the next place after theſe, *Caviare* is the Chief or Principal of all Salts or Pickles. It is made of the Eggs of Sturgeon, about the Shore of the *Euxine* Sea, which being well beaten and condens'd together, are pickled and barrell'd up in Casks or Hogſheads.

The *Pulpæ* alſo of Sturgeon it ſelf are pickled, of which is made a kind of Fleſh call'd *Spina*, or *Dorſum*, of the Fen *Mæotis*. 'Tis call'd now a days *Zabach*.

They us'd alſo to pickle a Fiſh call'd *Morona*, of which now we have no knowledge, but its Fleſh is brought from the *Daniſh* Ocean. There are brought alſo other Salt Fiſh (call'd *Herrings*) which are hardned and dry'd by the Sun in *Norway* and *Sweden*; as alſo the Fiſhes call'd *Marluci*, which for Hardneſs may be compar'd to Wood. I ſuppoſe none of theſe Fiſhes were in uſe among the Ancients.

The COMMENTARY.

[*The* Garum *and* Muria *of the Ancients.*]

If Curioſity deſires any further Acquaintance with theſe kind of Viands, whoſe Succeſſors are *Botargo* and *Caviare*, he may conſult the 19th Chapter of the third Book of *Langius*'s Epiſtles, and alſo *Dioſcorides*, who mentions ſeveral ſorts of it, and tells us how to make it, in the thirty firſt Chapter of his ſecond Book *De Re Medica*.

Garum was made of the Intrails of a certain kind of Fiſh, chiefly of Mackarel, after this manner: The Bowels of this Fiſh, after they were ſprinkled with Salt and their own Blood, were put up into an earthen Veſſel, where they lay waſting and corrupting for the moſt part about two Months; then an Hole being made in the bottom of the Veſſel, they diſtill'd that Liquor into another Pot ſet underneath to receive it.

And this Juice was of ſo great a value, that none other Liquids, except perfum'd *Ointments*, were more highly eſteem'd. Hence 'twas dignify'd with a proud Title, and call'd *Garum Sociorum*, becauſe not allow'd to be tranſported to any but the Allies of the *Romans*. For *Apicius* (that Virtuoſo in Luxury) ſaith that *Barbels* were moſt exquiſite Delicacies, being kill'd in *Sociorum Garo*.

As *Garum* was a Liquor made of corrupted *Mackarel*, ſo *Muria* was made of putrify'd *Tunny*. This was the *Diſh* of the Poor, and that of the *Rich*, and therefore 'twas call'd *proud* and *precious*.

The AUTHOR's Concluſion.

THeſe are (Moſt Serene Prince!) the Things and the Arts, the Manners and Cuſtoms, which I thought good to treat of; by ſhewing Your Highneſs, how that ſome Things formerly have been on the *Stage*, and have diſappear'd; and how that others, inviſible and behind the *Curtain*, have expos'd themſelves to publick View. Some have vaniſh'd and withdrawn from the World, and others have ſprung up afreſh in their room; that from hence we may ſee the *Majeſty* of Nature, and the many excellent *Arcana* and choice *Secrets* that are treaſur'd in her Boſom.

Thoſe of leſs Moment I have deſignedly omitted, as unworthy your Cognizance. If I have not pleas'd your Excellency with theſe, yet I hope you will accept the *Sincerity* of my Heart, and my Readineſs to ſerve you. To whoſe Honour and Dignity, I devote my ſelf with the profoundeſt *Reverence* and moſt humble *Submiſſion.*

ADDENDA *to the Account of the Invention of* PRINTING.

THE following Account is taken out of *Cornelius a Beughem*'s *Incunabula Typographiæ*, a Catalogue of all the printed Books in every Language, from the firſt Invention of Printing, to the Year 1500. Out of which we have ſelected every firſt Book which we find printed at *Abberville*, *Aloſt*, *Antwerp*, and other Places, which we have diſpoſed in an Alphabetical Order, that the curious Reader may ſoon ſatisfie himſelf in this Point of Antiquity, and ſee how quickly it ſpread throughout *Europe*. We have given all that we could find printed in that Time at *Weſtminſter* and *Oxon*, as more nearly concerning our ſelves. And think fit to tranſcribe *Beughem*'s entire Account of the old Editions of the Holy Scriptures, which we preſent by it ſelf, and in the firſt Place as he hath done.

Bible in *Hebrew*, Fol. & 4to. moſt correct, 1494.
----- *Latin*, *Mentz* 1450.
----- *Fauſtus* and *Schæffer*'s Edition at *Mentz*, as *Salmur* affirms in his Notes upon *Pancirollus*; but *Saubert* ſays, he could never ſee it, 1459.
St. *Jerom*'s *Latin Bible*. Fol. 2 Vol. *Mentz* 1462.
----- Vulgar *Latin*, *Reutling* 1469.
----- Vulgar *Latin*, *Noriberg* 1476.
----- Same again, *Ibid.* 1477.

Latin

Several Editions of St. *Jerom*'s and Vulgar *Latin Bibles* at *Ausburg*, 1466. *Venice*, 1476. *Noriberg*, 1479, & 1484. *Baſil*, 1485, 1487, 1491, 1495.

----- With *Lyra*'s Commentary, *Rome*, 1472. 5 Vol. *Colon*, 1478, 1480, 7 Vol. Fol. with *Peter Mollenbeck*'s Table, at *Baſil* 1498.

----- In *Dutch*, at *Delf*, 1477. Fol. at *Goude*, 1479. Fol.

-----In *German* with wooden Cuts, *Noriberg*, 1483.

----- In *German*, tranſlated from the Vulgar *Latin*, *Ausburg* 1494.

I have ſeen this laſt Date Written 1449. but I look upon it to be a Miſtake. Theſe are all the Editions of the Bible I have ever ſeen.

A.

ABbeville *in* Picardy. Abbevillæ 1486. S. Auguſtin. de Civitate Dei; Gallice, Fol.

Oudenard. Aldenardæ 1480. Sermones Hermani de Petra in Orationem Dominicam.

Aloſt *in* Flanders. Aloſti 1487. D. Chryſoſtomus, De Providentia. De dignitate humanæ Originis. Lat.

Amberg *in* Bavaria. Ambergæ 1471. M. T. Ciceronis Orationes omnes, Fol.

Antwerp. Antverpiæ 1487. Fr. Philephi Epiſtolæ, 4to.

Aquila *in the Kingdom of* Naples. Aquilæ 1482. Plutarch'*s Lives in* Italian, *by* J. B. Jaconellus, Fol.

Rimini, *a City in the Papacy*. Arimini 1486. R. Joſeph Albos Arbor Plantata, Heb. 4to.

Ausburg. Auguſtæ Vind. 1471. J. Boccatii Hiſtoriæ de claris mulieribus, Germanice.

B.

Banberg *in* Franconia *in* Germany. Bambergæ 1499. Breviarium Romanum.

Barcelona. Barcellonæ 1494. Conſobat. de martyrio.

Bolduc *in* Brabant. Boſcaducis 1487. XX. Præcepta elegantiarum Grammaticalium.

Baſil. Baſileæ 1475. R. Carocholus de Licio, Sermones Quadrageſimales.

Bergamo *in* Italy. Bergami 1498. Chirurgiæ Scriptores varii, ſc. Guido, Brunus, &c. Fol.

Bolen *in* Picardy. Boloniæ 1473. Le Epiſtole, Lettioni & Evangelii de tutto l'anno.

Bologna *in the Papacy*. Bononiæ 1471. R. Obadia Sephorno, Lux populorum.

Breſſe *in the Common-wealth of* Venice. Brixiæ 1482. Gerard. Odo in Ethicam Ariſtotelis.

Bruges *in* Flanders. Brugis 1476. Boccace, La Ruine des Nobles Hommes & Femmes.

Bruſſels. Bruxellis 1478. Ægid. Carlerii Sporta Fragmentorum, Fol. 2 Vol.

C.

Colle. Collæ 1471. Oppiani Halieuticon Lat.

Cologn. Coloniæ 1471. Rudolphi Agricolæ Lucubrationes quædam, 4to.

Cremona *in* Milan. Cremonæ 1497. Sylveſter Prieras. Compendium ſeu Additiones in Joannem Capreolum.

Coſenza *in the Kingdom of* Naples. Cuſentiæ 1478. Diſcours de la Grandeur de Dieu, 4to.

D.

Deventre *in* Over-Yſſel, Daventriæ 1457. Hiſtoria de B. Virginis Mariæ Aſſumptione, 4to.

Delf *in* Holland. Delphis 1480. Sancti Bernardi Poſtillæ majores, Fol.

E.

Erfurt *in upper* Saxony. Erfurti 1482. Luterus, De Anima.

Eſſling *in the Circle of* Suabia *in* Germany. Eſlingæ 1475. Petrus Niger. Tractatus de Judæorum perfidia.

Eychſtad. Eyſtedii 1488. Obſequiale ſive Benedictionale Eyſtetenſe.

F.

Ferrara *in the Papacy*. Ferrariæ 1474. Bonus Accurſius. Animadverſiones in Cæſaris Commentaria, 4to.

Florence. Florentiæ 1477. Alphonſi Quæſtiones in Ariſtotelis libros de Anima.

Friburg *in* Suabia *in* Germany. Friburgiæ 1494 Aug. de Civ. Dei cum Comment. Tho. Valois, & N. Trivet. Fol.

G.

Caeta *in* Italy. Gaetæ 1488. S. Gregorii Dialogi, cum vita ejus, Italice.

Ghent *in* Flanders. Gandavi 1483. Guillermi Rhetorica Divina, 4to.

Geneva. Genevæ 1482. Le Livre d'Olivier de Caſtille & Artus d'Algarlee, Fol.

Genoa. Genuæ 1471. Virgilii Æneides in Proſa Italica, 4to.

Gentiæ 1480. Johannes Annius de futuris Triumphis contra Saracenos.

Goude *in* Holland. Goudæ 1480. Gerard de Leeu. Geſta Romanorum moralizata.

H.

Hagenau *on the upper* Rhine. Hagenoæ 1489. Joan. de Gurlandria Cornutus, ſive diſticha hexametra moralia.

Hamburgh. Hamburgi 1491. Laudes Mariæ Virginis, Fol. maj.

Harlem 1441. Spiegel onſer behoudeniſſe. Donatus Gram. 1440.

Haſſelt. Haſſeleti 1481. Recollectorium ex geſtis Romanorum, Fol.

Heidelberg. Heidelbergæ 1480. Jodocus Gallus. Opuſculum, noſce teipſum inſcriptum.

Sevil. Hiſpali 1491. Alphonſi Toſtati Opera.

I.

Ingolſtadt *in lower* Bavaria. Ingolſtadii 1492. Porphyrii Iſagoge.

L.

Leipſick. Lipſiæ 1474. Balthaſar de Lipſia. Concluſiones 39 contra J. Huſs, De Sacramento.

Lovain. Lovanii 1474. Petrus de Creſcentiis, De Agricultura, Fol.

London 1481. Joan. Valdeſius ſuper Pſalterium.

Lubeck *in* Holſtein. Lubecæ 1475. Chronicon. &c. Tit. Rudimentorum Novitiorum.

Lyons. Lugduni 1477. Vinc. Ferrarii Sermones de Sanctis, Gallice, Fol.

M.

Mantua. Mantuæ 1473. Pet. de Abano. Tractatus de venenis, 4to.

Memmingen *in* Suabia. Memmingæ 1484. Antonini Archiep. Confeſſionale.

Mentz, Moguntiæ 1459. Durandi Rationale Divinorum Officiorum.

Meſſines *in* Sicily. Meſſinæ 1486. Hiſtoria præliorum Alexandri Magni, Fol.

Milan. Mediolani 1469. Aratoris Cardinalis Sacra Poeſis, Fol.

Mirandola *in* Italy. Mirandulæ 1496. D. Cypriani Carmen de Ligno Crucis.

Modena. Mutinæ 1487. Caſſandræ Venetæ oratio pro Betrutio Lamberto.

N.

Naples. Neapoli 1472. Andr. de Iſernia Commentarii ſuper Conſtitutiones Siciliæ, Fol.

Norimberg *in* Franconia. Norimbergæ 1479. Rob. Carocholus De Licio, De hominis Formatione.

O.

Oxford. Oxoniæ 1479. Ægidius de Roma, De peccato Originali, 4to.

P.

Padua. Patavii 1482. Pet. de Abano in Problemata Ariſtotelis.

Pavia *in the Dutchy of* Milan. Papiæ 1473. Paris de Puteo, De Syndicatu.

Paris. 1463. . L'Art de Rhetorique pour faire Hymnes, &c. Fol.

Parma. Parmæ 470. Plin. Hiſtoria Naturalis, Fol.

Peſcia. Piſciæ 1489. p. 120. Laurent. de Rodulphis, Repetitiones & Diſputationes Juris.

R.

Ratisbon. Ratisbonæ 1471. Servii Comment. in Virgilium, Fol.

Reggio *in the Kingdom of* Naples. Regii Lepidi 1481. Propertii Elegiarum Lib. IV.

Reutlingen *in* Suabia. Reutlingæ 1473. Pet. Comeſtor. Hiſtoriæ Sacræ libri 16. al. Hiſtoria Scholaſtica, Fol.

Roan *in* Normandy 1488. Le Roman du Roy Artus, Fol.

Rome. Romæ 1467. Joan. de turre cremata, Meditationes in figuras Romæ in Templo B. Mariæ de Minerva, Fol.

Roſtoch *in lower* Saxony. Roſtochii 1476. Lactantii Opera.

S.

Siena *in* Tuſcany. Senis 1489. Clauſulæ Epiſtolæ Ciceronis.

Spire *on the upper* Rhine. Spiræ 1471. D. Cypriani Epiſtolæ, Fol.

Strasburgh. Argent 1465. Hugo de S. Victore, De Sacramentis, Fol.

Swoll *in* Over-Yſſel. Swollæ 1479. S. Bonaventuræ Sermones de Sanctis, Fol.

Soubige. Sublaci 1465. Lactantii Divinarum Inſtitutionum Libri VII. Fol.

T.

Treviſo *in* Italy. Tarviſii 1467. Fra. Columnæ, ſub nomine Polyphili, Hypnerotomachia, Fol.

Salonichi *in* Macedonia. Theſſalonicæ 1493. R. Iſ. Abarbanel Comm. in Prophetas priores, ſcil. Joſuah, &c. Heb. Fol.

Toledo. Toleti 1486. Confutatorium Errorum contra Claves Eccleſiæ editorum.

Tubingen *in* Suabia. Tubingæ 1494. Conradus Summerhart, De Meſſia.

V.

St. Albans. Villa S. Albani 1480. Laur. Guil. de Saona, Rhetorica.

Venice. Venetiæ 1465. Joan. de Karthan, Faſciculus Medicinæ.

Verona. Veronæ 1468. Plinii Hiſtoria Naturalis, Fol.

Vienna. Viennæ 1461. Oratio Panegyrica Theodoſio Imp. dicta, 4to.

Vicenza *in the Common-wealth of* Venice. Vicentiæ 1476. Omnibonus Leonicenus. Comm. in Cic. de Oratore, Fol.

Ulm *in* Suabia. Ulmæ 1473. Chronicon Univerſale, Germanice, Fol.

Utrecht. Ultrajecti 1473. Hiſtoria Scholaſtica de vita Chriſti & Apoſtolorum, Fol.

W.

Weſtminſter. 1480. *Mirrour or Image of the World.*

Nic. Upton's *Book of Heraldry*, Anno 1496.

Virgil's Æneids *out of* French *into* Engliſh, 1490.

Directions for keeping the Feaſts of the whole Year, 1483.

Hiſtory of England *and* Ireland, 1480.

THE
PREFACE
TO THE
APPENDIX
TO
PANCIROLLUS.

THE ingenious Author of the foregoing Work lived in an Age which afforded him a double Proſpect; the One backward, when Ignorance and Darkneſs overwhelmed all Nations, and Learning was at ſo low an Ebb, that ſcarce ſo much as the Knowledge of the Latin Tongue was any where to be found: The Other forward, when Learning began to revive, and Arts and Sciences to be enquired after. The Times of Ignorance he hath fully deſcribed, and ſhewed in many Inſtances the Loſſes ſuſtained by it; but Learning *and Knowledge were in Embryo only in his Time, and ſo he could give us but little or no Account of any Improvements made in it. Had he lived to ſee the great Progreſs in Letters and Arts made in theſe later Times, no doubt he would have been as copious in deſcribing the Reſtoration of them, as he has been in repreſenting the Loſs. To repair therefore this Defect in* Pancirollus, *and give this Age the juſt Encomium of their Ingenuity and Diligence, the Reader is here preſented with a ſhort Specimen of Things invented, and improved in theſe later Ages, added by way of* Appendix; *which, as it will in ſome meaſure compleat the Author's Deſign, ſo will ('tis hoped) be profitable and grateful to him.*

Note, theſe Extracts are truly taken from Bp. Sprat's Hiſtory of the Royal Society, *which is made uſe of throughout; The Honourable Eſq;* Boyle's *Pieces: The* Philoſophical Tranſactions; *the* Memoirs of the French Royal Academy, *&c.*

AN APPENDIX TO *PANCIROLLUS*;

Containing a ſhort Attempt to make good his third Propſal in his Preface.

VIZ.

A Collection of ſome Modern Arts, and new Inventions, recommended to the World in theſe later Ages.

IF according to *Pancirollus*'s Deſign, we would make a juſt Eſtimate of our Loſſes, as he has repreſented them in the foregoing Books, in order to compare them with modern Inventions, and judge whether we are Gainers or Loſers in the Main, it will be requiſite to lay aſide in the firſt place, ſuch a Fondneſs for Antiquity, as to prefer a thing of little or no value, becauſe 'tis ancient, before a thing of true worth, becauſe 'tis modern; a braſs Coin of *Otho* or *Vitellius*, before a modern one of equal Bulk, though of the beſt Gold. And in the next place we muſt conſider, what Things were invented and uſed by the Ancients in their Heathen State, to adorn their Idol-worſhip, uphold their groſs Superſtitions, or to manifeſt a Grandeur, more than human, as they ſuppoſe, and how unbecoming moſt of theſe Arts had been to the ſame Places, and in the ſame Perſons, after they were converted to the Chriſtian Faith, when there was a Neceſſity almoſt, that many of theſe Arts ſhould be aboliſhed, as miniſtring to Idolatry, Vanity or Pride. Let theſe *Poſtulata* be granted, and then the Queſtion will be reduc'd into a ſmall Compaſs, whether of thoſe Arts and Sciences, which are neceſſary to the Welfare and Conveniency of human Life, greater Improvements were made by the Ancients than Moderns, and ſo our Loſs, by the Careleſneſs or Ignorance of Poſterity is irrecoverable; or whether the Ancients had more Arts, or better ways of managing them, or had a deeper Knowledge of Things neceſſary for the Support of Man's Life, or the Benefit of Society, than the Moderns have, of which the greater Part are loſt, which may, without great Difficulty, be clearly reſolved; and ſhall be endeavour'd under theſe general Heads.

I. Of Arts and Sciences, and the whole State of Learning.
II. Of Mechanical Arts and Trades.
III. Of the Arts and Engines of War.

Of every one of theſe, it muſt not be expected that all the Improvements of the Moderns can be particularly mentioned and compared with the Inventions or Improvements of the Ancients: It will be ſufficient to point at the Chief of them, and ſhew briefly on which Side the Balance turns, without any Partiality to either.

I. Of Arts, and Sciences, and the whole State of Learning. And here it muſt be granted, by all equal Judges, that ſince the late Invention of Printing has been communicated to the World, the Moderns have been put into a much better and eaſier way of attaining the Knowledge of all Arts and Sciences than the Ancients had. Books of all ſorts have been made more plentiful and cheap; the Writings of the Ancients have been brought out of their Cloiſters and Retirements, and the Preſs has rather wanted worthy Writers to commend to the World, than Authors the Preſs to publiſh their Works. Libraries are infinitely increaſed, and though that of *Ptolomy Philadelphus* in *Egypt*, and others at *Conſtantinople* and *Rome*, are much celebrated by Lovers of Antiquity, yet it is morally impoſſible they ſhould equal the Modern Libraries of the *Vatican* at *Rome*, *Medicæan* at *Florence*, *Venetian* at St. *Mark's*, the *Bodleian* at *Oxford*, and other Libraries in great Multitudes in Colleges, Monaſteries, Churches, Kings and Noblemens Palaces, and with private Men; and that chiefly, becauſe many of the moſt celebrated Writers were not in Being, and if they had been, the Treaſures of the greateſt Princes could not have paid Tranſcribers, if enough of them could have been found.

And if the Moderns have ſo much Advantage of the Ancients, as to the Means and Inſtruments of Learning, why ſhould it be ſuppoſed that they come ſhort of them in the Knowledge of Arts and Sciences? Do they want an equal Capacity, as if, like Man, the older the World grows, the more it inclines to Stupidity and Dotage? No, there was indeed an Age or two, when Men ſeemed altogether to degenerate into Sloth and Lazineſs, and ſo of courſe into Ignorance; but after the darkeſt Night, many times comes a bright and glorious Day: So after theſe Times of Ignorance, roſe a Generation of Men of vigorous, inquiſitive and ſubtil Spirits, who, aſham'd of the Sottiſhneſs of Prieſts and Monks (the Men that alone profeſſed the Knowledge of Letters) ſet themſelves to recover the loſt Arts, and in a few Years, not only brought in an earneſt Emulation of underſtanding the learned Languages, and fetched the ancient Authors out of the duſty Cells, to which for ſome Ages they had been chained as Priſoners in a Jayl, but printing them as correct as they could, caus'd them to be diſperſed through all Parts of the civiliz'd World; and ſo were the Inſtruments, not only of a Reformation of Religion, but of communicating all uſeful Knowledge to all Perſons and Places.

Near a whole Century was ſpent in this Work, and 'twas thought a ſufficient Employment for the moſt laborious and ingenious, to inform themſelves in the Writings of the Ancients, and ſee how far they had gone in the Knowledge of Nature and Art, and communicate their Sentiments, by Syſtems, Abridgments, and Tranſlations to ſuch, as were to be trained up in Learning in the Schools or Univerſities. But all theſe Studies and Searches, did only ſerve to quicken Mens Appetites the more after Knowledge. They found the Philoſophy of the Ancients wrapped up in dark and obſcure Terms, clogged with many ſtrained Principles and Maxims, and ty'd up to many tedious Diſtinctions and Rules, which rather burthened than inſtructed the Mind, and ſeem'd deviſed on purpoſe to conceal Ignorance by certain ſtrange Amuſements. It ſeem'd to theſe wiſe and ingenious Perſons, a thing very diſagreeable to the human Soul to be confined in its Thoughts to the Dictates of the moſt learned, and follow Errors, though in good Company; whereupon, making uſe of what the Ancients had well invented and carried on, they endeavoured to bring it to a Perfection, and wherein they had erred, to rectify and amend it, and of what they were wholly ignorant, to bring it into the Light, that the World might not want any uſeful Arts or Sciences. Hence it is, that within the Compaſs of leſs than a Century laſt paſt, ſuch wonderful Improvements have been made in moſt of them, that the Ancients can hardly be thought to have underſtood much more than ſome Principles or Elements of them.

It would take up many large Volumes to enlarge particularly upon the great Improvements which have been made in every Art by the Learned, in our own and the neighbouring Nations, who, having for ſome Years paſt united themſelves in a Body (call'd a Royal Society, becauſe much approved of, and eſtabliſh'd by a ſpecial Grant of King *Charles* II.) and divided their Inquiries according to the Genius of every particular Man, have brought in ſuch large Additions of all true and experimental Knowledge from all Parts of the World, that Men may ſeem to have pleaſed themſelves in a learned Ignorance in former Ages, rather than to have attained any true and thorough Knowledge of Things, as may be made evident by many ſpecial Inſtances, but muſt be contracted, that they may not become tedious to the Reader. And,

1. Logick, or the Art of Reaſoning, which, of all Arts, is one of the moſt uſeful and neceſſary, becauſe of that frequent Occaſion there is of communicating Mens Thoughts, Opinions and Deſigns one to another, either for their Inſtruction, Converſion or Direction in all Affairs of Life, is mightily improved. We are taught in a clear diſtinct Method by the old Logicians, not how to reduce Words or Things to certain Heads, as the *Genus*, or *Differentia*, the ſeveral Predicaments, *&c.* but to form in our Minds, firſt, juſt Ideas of Things, by conſidering them in their own Natures, and in the ſeveral Relations to other Beings; and having eſtabliſh'd a juſt Diſtinction of them in our Minds, connect them ſo ſuitably with one another, as to produce certain and infallible Conſequences and Concluſions. This way of reaſoning, renders all Arguments certain and demonſtrative; for there is no Sophiſm or Fallacy in Diſcourſe (though our ancient Logicians reckon up many) but in connecting Things, either not rightly underſtood, or uſed in ſome diſagreeable Senſe or Reſpect, and ſo making four Terms in the Syllogiſm. This Art of Thinking, is the higheſt Improvement of the human Underſtanding, and is juſtly attributed to Modern Invention.

2. Mathematicks hath almoſt arrived at a full Perfection, by the Study and Induſtry of the learned Men of theſe later Ages. Arithmetick can now teach us, not only to ſum up, divide, multiply, and abſtract from whole Numbers, but collect together the minuteſt Parts and Fractions, into one plain Total. Aſtronomy, through thoſe Optick Glaſſes, which are not only the Invention, but rare Improvements of the ingenious of this preſent Age, is now become an eaſy and familiar Science, a great Number of Stars being by Teleſcopes firſt diſcover'd, and now continually viſible, to the great Advantages of Navigation, which has received a like Benefit by the Geometrick Skill of the Mathematically Learned, who have ſo exactly diſcovered all the Degrees of Latitude, that Sailors can, without much Difficulty tell, in the broadeſt part of the Ocean, whereabouts they are, at what Diſtances from Shore, and from what Country. Scarcely any thing in this Nature has been able to poſe them, but the Longitude of the Globe, which now ſeems to be near a Diſcovery, becauſe a large Reward is promiſed to the Author of it; which ſhews, that it was rather kept ſecret, than not known, and only wanted an Encouragement to bring it abroad; all which, Antiquity had little or no Skill in.

3. Phyſicks, or Natural Philoſophy, by which the Nature of created Beings are made manifeſt to us for our Uſe or Avoidance, is another Science, which of late has received mighty Improvements, by modern Obſervations and Experiments: Antiquity had their Syſtems of Natural Philoſophy, as they call'd them, but

made up of ſome few Definitions, groundleſs Suppoſitions, idle Queſtions, obſcure Terms, and empty Diſputations. They looked only upon the Surface of Things, and never div'd into the inward Receſſes of Nature, where the Properties and Virtues of every Creature lie, but concealed their Ignorance under the Names of occult Qualities, Privations, Entelechia, and the like Terms, which paſſed for good Philoſophy with their credulous Scholars. But the learned Men of our Age will take nothing upon Truſt, but bringing to a ſtrict Examination the Form, Figure, and Qualities of every the ſmalleſt Animals, as Mites, Ants, *&c.* lay open to our view the beautiful Boſom of Nature, and preſent to our Eyes the plain Motions and Operations of Things, if not for our own Uſe and Benefit (as in moſt Things it has happen'd) yet for the Advancement of God's Glory, in ſo wiſely forming the ſmalleſt Creatures. And how many of theſe have our ſagacious Searchers found out, which all the Ancients, though in their Generation wiſe, did know nothing of, is impoſſible to name?

4. Medicks, or the Art of Medicines, under which we may comprehend all the Methods of healing, whether by preparing Medicines, or applying them, as Chirurgery, Chymiſtry, or Medicks, all theſe are very much improved, by the Induſtry and Experience of the learned of our later Times. What Multitudes of Drugs of very excellent Uſe are fetched from all Parts of the World, and united in the Apothecaries and Druggiſts Shops, for the more ſpeedy and certain Preſervation and Recovery of the Health of human Bodies? No one Country bears all

Things neceſſary for Medicine, more than for the Food of its Inhabitants, we muſt fetch them from others; and ſuch is the Induſtry of theſe laſt Ages, that as many Things in our own Country are better known than formerly, ſo we have learned where the *Materia Medica* may be ſupply'd to us from all Parrs. The Anatomy of Man's Body is fully diſcovered, by frequent Diſſections, the Nature and Uſe of all the Nerves, Tendons, Glands and Bones, is at large explained; the Circulation of the Blood ſo curiouſly obſerved, that our Phyſicians know how many times it moves round the Body in twenty four Hours. Wonderful almoſt are many Operations in Chirurgery, never experienc'd by the Ancients; as cutting of the Stone, with little or no Loſs of Blood, and a very ſmall Danger of Life, breaking of diſtorted Limbs and Bones, and placing them in their right Form, and that with ſo much Art, as to be as uſeful as in their natural Poſition, and without any Deformity to the Patient: Nay, in Caſes of dangerous Quinſeys, making an Aperture in the Oeſophagus, or Wind-pipe, that the Patient may draw his Breath that way, while his Throat is cured, and ſo Life may be preſerved. The Chymiſt by his Fires hath found out a way to extract Medicines of extraordinary Force and Uſe, from Bones, Stones, Horns, Poiſons, Minerals, dead Fleſh, and a thouſand other Things, not more to the Admiration, than Benefit of others. Theſe Arts, though practis'd moſt of them in ſome degrees by the Ancients, yet far ſhort of the Improvements made by the Moderns, who are daily trying new Experiments, and making more profitable Additions to their ſeveral Arts.

5. Geography, or a Deſcription of the ſeveral Nations and Countries of the World, has alſo been much improved by the Navigations of the Proteſtants, and Miſſionaries of Popiſh Countries. The greateſt part of the new habitable World, was altogether unknown to Antiquity. The *Roman* Arms, which were thought to have brought all Nations under their Dominion, never reached many flouriſhing Kingdoms, with which now are great Seats of Traffick and Merchandize, and of which we have very uſeful Accounts, of their Laws, Manners, Products, Religion and Cuſtoms, to the no ſmall Advancement of the Wealth and Happineſs of the trading Nations of *Europe*. Thus *China*, *Japan*, many Parts of the *Eaſt Indies*, the Spice-Iſlands, the whole Continent of *America*, with the appendant Iſles, from whence yearly are fetched ſuch vaſt Quantities of Gold, Silver, Silks, Spices, and many other rich Commodities, were unknown altogether to the Ancients; but are now ſo well known to our Age, that in them we have eſtabliſhed Factories, and a continual Traffick to their Ports, as if they were our own native Countries, continually importing into them what they need, out of our Plenty; and again, bringing from them what our native Soil does not at all, or at leaſt not ſo plentifully produce. There is ſcarce any Nation, but by this Means the Inquiſitive have had an Opportunity to ſearch into their Cuſtoms, Laws, Religion, Animals, Fruits and Manufactures, and ſingle out what might be of Benefit to themſelves and Countrymen; as

may appear from a Collection of Voyages and Travels not long ſince printed, which are great Advantages not enjoy'd by the former Ages, and muſt be accounted the Happineſs of the preſent.

Moſt other Arts and Sciences have in theſe later Ages been looked into by the ingenious, with equal Application, and received by them no ſmall Additions and Improvements, as Muſick, Writing, *&c.* But I ſhall conclude this general Head with ſuch Improvements, as have been made in theſe later Times in that Art of Arts,

6. Chriſtian Theology, or the Knowledge of Divine Things, derived to us by the true Underſtanding of the Holy Scriptures. The moſt ancient Fathers of the Chriſtian Church, being plain, well-meaning Men, and living under perſecuting Governours, had no Leiſure to enquire into the Myſtical Doctrines of Chriſtianity, but thinking it ſufficient to believe in one God, and one Lord Jeſus Chriſt, and one Spirit, were not farther ſollicitous about the Articles of Faith, than to bring forth good Works, and in the daily Exerciſe of an humble Devotion, expect the Crown of Martyrdom. When the Church was ſettled in Peace under *Conſtantine* the Great and his Succeſſors, many Philoſophers being converted to Chriſtianity, great Differences of Opinion aroſe, and many knotty Queſtions were ſtarted about the eternal Generation of the Son of God, the Proceſſion of the Spirit from the Father and Son, the Union of the two Natures in the Perſon of Chriſt, Freedom of Will, Predeſtination, and many other difficult Points, both Parties alledging

the Scripture in their own Defence. The School-Divinity, which ſucceeded, did not much help to put an end to theſe Diſputes, but by its many nice Diſtinctions and Poſitions, enabled the contending Parties to go on eternally in their Debates, all endeavouring rather to make the Scripture ſpeak what they pleaſed, than hear it ſpeak the Truth. The learned Men of theſe later Ages have taken a quite different Method of knowing the Chriſtian Doctrine, which is, by enquiring into the true Method of interpreting of the Scriptures of the New Teſtament, not according to the Uſage of the Native *Greeks*, but *Helleniſts*, who being Jews by Birth, but uſing the Language of the *Greeks*, gave it ſuch a Turn according to the Hebrew Idiom, that it became of a quite different Signification, and ſo they gained a clear Senſe of many Places, before obſcure; and then paraphraſing the whole Text with eaſy and plain Words, made the Doctrine of the New Teſtament very obvious and intelligible, and freed it from many of the harſh and corrupt Gloſſes of the Ancients and Schoolmen. So that Divinity is now become almoſt a clear different Science, a familiar Inſtruction in Matters of Faith and Manners, readily apprehended by docible and unprejudiced Minds, obliging us not to pry nicely into the Nature of the Divine Perſons; but, contenting our ſelves with what is revealed, beſtow all our Time and Labour in framing our ſelves to ſuch a chearful Obedience, as may prove our Faith rather ſound than curious.

2. The Mechanical Arts, tho' by former Ages eſteemed below the Regard of the Learned,

have not been contemned by the inquiſitive of the later Ages. They have had a more ſerious Regard to the common Good, than to ſuffer their Minds to be always hovering aloft in Speculation; and as they have endeavoured by all Means to make the liberal Sciences more practical, ſo they have not diſdain'd to look into our Manufactures, Country-Buſineſs, and common Shop-Trades, that finding them any ways defective, they may make ſuch Additions and Improvements, as might render them more eaſy and gainful, not to themſelves, but to the ſeveral Artificers. And though theſe Attempts met at firſt with no ſmall Diſcouragements, even from the Mechanicks themſelves, whoſe Good alone was intended, yet when they ſaw their Labours anſwered by Succeſs, they have valued their own Arts the more, becauſe of the Improvements which have been made by theſe ingenious Inquirers. It would be endleſs to enumerate all the Particulars in this kind, and ſhew almoſt in all Trades, what wonderful Improvements have been made by their Means alone, either in diſcovering new Things, altogether unknown before, or deviſing ſuch Tools and Inſtruments, Methods and Engines, as have made the Work more curious, and of much quicker Diſpatch. I ſhall inſtance in ſome of the Principal only, and ſhall not allow my ſelf in them to mention all Particulars, leaſt I become voluminous. I ſhall begin with,

1. Agriculture, or, as we uſually call it, Tillage, Husbandry, or Country-Buſineſs, including under this Name, Gardening, in all its various Parts, as the moſt ingenious of all

manual Arts, and the moſt becoming Men of all States and Conditions, becauſe 'twas the Employment to which God at firſt created us; and, if we conſult our Inclinations, moſt Men will find themſelves naturally addicted to. The *Romans* of old had reduced this Knowledge to ſomething of an Art, as we may judge from the Treatiſes of *Varro* and *Columella* about Huſbandry; but how infinitely ſhort they come of our modern Improvements, will be eaſy to judge, if we take notice of the Particulars following.

It is one of the firſt things to be known in Huſbandry, of what Nature the Soil is which Men are about to cultivate, ſow or plant. The Ignorance of this Point has occaſion'd the loſs of much Coſt, Labour and Time, both in digging, ploughing and manuring. To inſtruct our Huſbandmen and Gardeners in this Point, the Learned in theſe later Ages, have made a particular Inquiry into the ſeveral ſorts of Earths, Compoſts and Dungs, and deſcribing their Natures, have given ſuch Directions to know them by their Colours, Contexture, Brittleneſs or Clammineſs, and how to apply them accordingly, that were they diligently attended to, they would make a mighty Addition to our Plenty in general, and prevent many of the Misfortunes of particular Men, who are ruined by this Art merely for want of Skill. No Land could be barren, if the various kinds of Compoſts and Earths were well underſtood, and rightly apply'd; nor could any Man ſow in vain, if to his well-manured and cultivated Earth, he knew what Seed were moſt proper for a Production, which cannot well be miſtaken, if the Nature of the Soil and Seeds be well known, as by their Deſcriptions they eaſily may.

And becauſe the next Requiſite to Fertility, after the Earth is well prepared, is ſound and good Seed, and Preſervation of it, when it is committed to the Earth: Theſe judicious Inquirers have found out Ways to impregnate Seeds, by ſteeping them in rich and fat Liquors, which will make them fructify and flouriſh in barren Soils; and to free them from Smut, Worms, and the like, by liming them, and other Means, which are great Improvements in this Art.

But above all other Parts of Husbandry, Gardening hath in this later Age received the greateſt Improvement, as may eaſily be conjectured from the great Rents given for Land proper for ſuch Tillage, near Cities and Market-Towns, from twelve to twenty four Pounds *per* Acre, which could not be afforded, were not the Product of the Ground almoſt incredible, to anſwer their Labour and Charge of Seeds, Stocks, *&c.* with ſo large a Rent. And indeed nothing but the Exquiſiteneſs of Art and Management could produce ſo great an Effect. All ſorts of Trees, Standards, and for Walls, of the beſt kinds, both Engliſh and Foreign; all ſorts of Herbs, as well for Phyſick, as the Kitchen and Table; all ſorts of Roots and Flowers, Muskmelons, Exotick Plants, and Perennial Greens are here produced, and that in ſuch Multitudes, that all Charges are abundantly anſwer'd, and the Artiſts many times enriched, by the plentiful Fruits of a few Acres of Land.

Farther Attempts and Improvements are made, and daily carrying on. by tranſplanting out of one Land into another of the ſame Situation, in reſpect to the Heavens, which have redounded already to the great Advantage of the Undertakers and Adventurers; as, the Oranges of *China* have of late been brought over into *Portugal*, and have thriven ſo wonderfully there, that by their Tranſportation into our own, and other Nations, they have brought a conſiderable Gain to that Kingdom. Nor has the Removal of Vines from the Banks of the *Rhine* into the *Canaries*, wanted its deſired Succeſs, for they have there yielded a far more delicate Juice than in their native Soil; by which Means, the Rocks and Sun-burnt Aſhes of thoſe Iſlands, are now become one of the richeſt Spots of Ground in the World. And why may not other as profitable Experiments of the like Nature be made, by conveying the *Eaſtern* Spices, and other uſeful Vegetables into our *Weſtern* Plantations in *America*? For it can hardly be imagined why they ſhould not thrive as well in the *Weſt* as *Eaſt Indies*; and why the Soil ſhould not be as ſuitable for them where the Sun ſets, as where it riſes, ſeeing both Parts may lie under the ſame Influence of that and the other Celeſtial Bodies.

And much eaſier may it be effected to remove the profitable Productions of one Country into another of near Situation, as Flax into *Ireland*, where are many vaſt Tracts of Ground, now only poſſeſs'd by wild Beaſts, or Tories; or from one part of the ſame Country into another, as the *Kentiſh* Cherries, and *Herefordſhire* Apples into all Parts of *England*, that by practiſing riſing the ſame ſort of Tillage in the whole Nation, all Parts may be equally enriched. It is very evident, that our Gardens and Orchards are ſtored with many delicious Fruits, as Apricocks, Peaches, Pears, *&c.* from our Neigbours the *French*, and, no doubt, but the prying and ſearching Genius of ſuch as enjoy the Gain and Pleaſure of this Art, will make new Improvements daily, by inoculating, grafting, and ſearches out of Curioſities of all kinds.

From the Surface of the Earth have theſe ingenious Perſons deſcended into the Bowels of it, and made many new and profitable Diſcoveries, not only for the Benefit of Husbandmen, but the Advantage of other Arts; for by a new kind of Augur to bore the Ground with, they have found out divers ſorts of Earth, ſome of them proper to mend and reſtore barren and ſtony Land, naturally unfit for tilling, or worn out with long cropping; by which Means the Grounds diſtant from Market-Towns, where Dung cannot be had, may be repaired and made fruitful with Clays, Marls, Looms, and other Earths, more ſuitable for Graſs and Corn than the Dung of Animals: others proper for Artificers, as Potters, Pipe-makers, Founders, *&c.* One ſort of late has been found out, which hath made Wares of many ſorts, not much inferiour to Porcelain, or China-Wares, ſo much admired and ſought for by our Ladies and Gentry.

By the Conſideration of the divers ſorts of Earths, they have been lead to take a View of divers kinds of Mines, and the Workmen in them, as Coal-Mines, Lead and Tin-Mines; and here they have by their Experiments, produced divers uſeful Inventions, as about refining Tin and Lead-Oar more eaſily and exactly; hardening Steel ſo as to cut Porphyry with it; and again, ſoftening it ſo much, as to make it more eaſy than uſual to be wrought on; impregnating Lead Oar with Metal after it has been freed from Droſs; making Quick-ſilver; diſtilling of Coal; extracting a much greater Quantity of Silver out of the Lead-Oar than is commonly done; reducing Litharges into Lead ſeveral Ways; changing Gold into Silver. *&c.* And becauſe our Workmen in Mines ſuffer many Inconveniences from Damps ariſing in their Mines, carried many Furlongs under Ground, they have found out Ways of recovering them from the Fatal Effects of thoſe dangerous Vapours.

Here it will not be impertinent ro mention the Art of drawing Salt-Petre out of the Earth, a modern Invention certainly, altogether unknown to the Ancients; for though (as *Pliny* in his *Nat. Hiſt. l.* 31. *c.* 10. relates) they had ſuch Minerals as they called *Nitrum & Apronitrum*, they had no Skill at all to refine them from the Earth, and common Salt mingled with it, nor from that foul Oil, which always accompanies it in great Abundance. But our Moderns have not only found out the Places where it grows in great Plenty, as in ſome Stables, Pigeon-houſes, Cellars, *&c.* which the Artificers can eaſily diſcern by the bitter Taſte of the Earth, but to refine it from all its Fæculency and Oil, by which it becomes uſeful for many Things, but eſpecially for that wonderful Thing called Gunpowder, the Invention of which is aſcribed by the *Germans* to *Conſtantine Autlitzer*, or *Berthold Schwertz*

Schwertz a Monk of *Friburg*, who taught the *Venetians* the Uſe of it about the Year of Chriſt 1380.

With the Obſervation of Earth, they have joined the particular Conſideration of ſome extraordinary Stones, as of Diamonds, how to increaſe the Luſtre; the *Bononian* Stone; the *Indian* Stone at *Fetipoca* near *Agra*, which may be cleft like Fir-Wood, as if it had a Grain. The People make but a Mark upon the Stone, and then with a Wedge and wooden Hammer, cleave it to what thickneſs they pleaſe, and pave their Houſes with it in Pieces about a Foot ſquare. But becauſe the Loadſtone is above all others the moſt uſeful in Navigation, which is now grown the common Buſineſs of all the richeſt Nations of the World, they have beſtowed much Pains to find out the Nature of it, that that Art may arrive at the greater Certainty. And to this End, they have examined into the Strength of ſeveral Sorts of Loadſtones, ſome of them *Engliſh*, and tried, what Weight they would bear; conſidered the Variation of the Loadſtone in two *Eaſt-India* Voyages, and other Places; and to prevent the like Accidents for the future, have made many magnetical Experiments, as about the beſt Form of Capping them; of the moſt convenient Shapes of the Needles, their ſeveral Lengths and Bigneſſes; the various Ways of touching Needles on the Loadſtone, and making the ſame Pole of the Loadſtone both to attract and chaſe the ſame End of the Needle without touching it; the Variation at *London*; the magnetical attractive Power at ſeveral Diſtances, and through ſeveral Mediums, as Water, Air, Wood, Lead, Stone, *&c.* which have had ſuch an Effect, as was deſired for the general Benefit of Navigation.

In the Veins of the Earth, they obſerved the Paſſages of Springs, which are the Originals of Rivers, Lakes, Meers, and Ponds, and from thence were invited to conſider their ſeveral Natures, and by their Experiments have found them of divers Qualities fitted for ſeveral Uſes; as ſome of an oleaginous and bituminous Nature; others petrifying, others medicinal; ſome fit, others altogether unfit to be uſed in brewing Beer or Ale. They have diſcovered a Spring in *Lancaſhire*, which will preſently catch Fire on the approach of any Flame. And being employed on this Subject, they have made many curious Experiments and Obſervations about Water in general; as of the riſing and diſappearing of Springs; of artificial Springs; of the Water-blaſts of *Tivoly*; of the ſhining of Dew in a Common of *Lancaſhire*; of the comparative Gravity of ſalt Water and freſh; of the different Weight of the Sea-Water in ſeveral Climates and in ſeveral Seaſons; of the Preſſure of Waters at the ſeveral Depths under its Surface; of the propagaring Sounds under the Water; of the reſiſtance of Waters to Bodies of various Figures, as they are moved on its Surface, and its ſeveral Degrees of Force, that Veſſels for Sailing may be made of the beſt Form for laſting and Expedition; the Expanſion and Condenſation of Water by Heat and Cold, and ſeveral Ways of Preſſures; the *Torrecellian* Experiment tried with Water; the different Weight and Refraction of warm Water and cold; of the living of ſome Fiſhes, and the dying of others in the

Water, after the Preſſure of the Air is taken away in a rarifying Engine; of raiſing Water above its Standard by Suction, with many ſuch uſeful Experiments.

2. Handicraft Employments, notwithſtanding they have been moſt of them uſed many Ages, yet have received moſt of them many Improvements from the Experiments of theſe learned Inquirers. It was the Fault of the Ancients, that they made all their Natural Philoſophy utterly uſeleſs in reſpect of the good of Mankind, reſerving it for the Retirements of their wiſe Men, without any Help or Benefit deſigned for the Vulgar, either in City or Country. But our Modern experimental Philoſophers are now reſolved to bring Learning down again into Mens Sight and Practiſe, and put it into a Condition of ſtanding out againſt the Invaſions of Time and Barbariſm, by eſtabliſhing it upon ſuch a Foundation, as that Men muſt loſe their Lives and Hands, before they can be made to forget, or willing to part with ſuch Pleaſures and Conveniences of Life. What they have done in this kind, may be reduced to theſe two Heads:

1. What Arts being of old very imperfect, they have almoſt brought to the higheſt Pitch of Perfection.
2. What Arts they have much helped by inventing new Inſtruments for the better and more ſpeedy working, and accurate performing.

1. As to the Arts, which Antiquity indeed had ſome Knowledge of, but have been derived

down to us very imperfect. Theſe the Learned of theſe later Ages, have by their Experiments brought to almoſt the higheſt Perfection. We may inſtance in a few; as I. The applying of the Motion of Pendulums to Clocks and Watches, by which the Meaſures of Time are brought almoſt to an exact Regulation. The Honour and Reputation of this uſeful Invention, muſt be attributed to *Hugenius*, a learned Gentleman of the *Low-Countreys*, who has beſtowed his Pains on many Parts of the Speculative and Practical Mathematicks with wonderful Succeſs: But as the Beginnings of all Arts are a little rude and unpoliſhed, till the little Jogs are rubbed off by Experience and Time, ſo this worthy Gentleman would not venture it into the World, till he had received the Confirmation and Approbation of our *Royal Society*, who having made divers Trials, from which he made ſeveral Alterations and Amendments, brought it to an admirable Perfection: For they firſt tried the Motion of Pendulous Bodies of various Shapes, and contrived the beſt Figure (as near as they could) of a Pendulum for Motion, determined the length of Pendulums, and found out the Velocity of Motion propagated by a very long extended Wire, which they did not ſo much for the Uſe of Clocks, as in Order to the explaining the Motion of the Planets. They made alſo farther Trials of the circular and complicated Motions of Pendulums, to explain the Hypotheſis of the Moon's moving about the Earth, and compared the Motions of a Circular Pendulum, with the Motion of a ſtreight one, by which Means the Motions of Clocks and Watches are brought to almoſt an unerring Exactneſs, of which the Benefits are almoſt infinite.

2. The Excellency of our Optick Glaſſes. The *Engliſh* of late Years, have gotten an Art of making Glaſs finer than that of *Venice*. This Invention was at firſt brought into our Country, by the Care and Expence of the late Duke of *Buckingham*, and has mightily been advanced by the Induſtry of the Learned, who have found out Inſtruments for grinding theſe Optick Glaſſes, in the exacteſt Manner poſſible, and adapting them to the Sight. Many are the excellent Fruits of their Labour in this Kind, for they have invented double Teleſcopes, and ſeveral ſingle ones, but of divers Lengths, from ſix to ſixty Foot long, with a convenient *Apparatus* for the managing of them, and ſeveral Contrivances in them for meaſuring Diameters, and Parts of the Planets, and for finding the true Poſition and Diſtance of the ſmall Fixed Stars and Satellites. By help of theſe Inſtruments it is, that Aſtronomy is come to a great Perfection, and many Things otherwiſe indiſcernible in the Heaven, are come to the Knowledge of the curious Inquirer; as about *Saturn*, its Proportion, and the Shadow of its Ring; the Phaſes of *Jupiter*, its Spots, Verticity, and Satellites; Spots in the Lady of *Mars*, and its whirling about its own Centre; and the Eclipſes of the Sun and Moon, moſt of them never before taken Notice of by any of our Aſtronomers. So conſiderable an Invention is to be obſerved from ſo mean a Matter. And as by Glaſſes, Things diſtant are made evident to our Sight, ſo alſo many Things that are preſent and near us, but through their Smallneſs eſcape our Eyes, are by another Sort of Glaſſes, called Microſcopes, made

plain to our Obſervation. Before this Invention, the chief help that was given to the Eyes by Glaſſes, was only to ſtrengthen the dim Sight of old Age; but now by Means of this excellent Inſtrument, we have a far greater Number of different Things revealed to us, than were contained in the viſible Univerſe before, and we by the Uſe of them ſeem to be in a new World at Home. Thus in two moſt uſeful, though mean Arts (as they are eſteem'd) have the Learned of theſe Days ſignalized themſelves.

2. And in all the other Arts they have contributed ſo much, that they may be eſteemed no ſmall Benefactors to them, in advancing their Perfection, and inventing Inſtruments for the more eaſy and exact working of them. It would be too tedious a Work to give a full Catalogue of them all, and therefore the moſt uſeful ſhall only be here mention'd, *viz.* An Hoop of the fixed Stars in the Zodiack, for the ſpeedy finding of the Impoſition in the Ecliptick, and for the knowing the Extent of Conſtellations. A great many new Ways of making Inſtruments for keeping Time very exactly, both with Pendulums and without them, whereby the Intervals of Time may be meaſured both at Land and Sea. An Univerſal Standard or Meaſure of Magnitudes, by the help of a Pendulum never before attempted. Several Sorts of Inſtruments for the compreſſing and rarifying the Air; as alſo a Wheel-Barometer, and other Inſtruments for finding the Preſſure of the Air, and ſerving to fore-ſhew the Changes of Weather. An exact Pair of Scales for trying a great Number of Magnetical Experiments, and finding the

moſt exact Gravity of ſeveral kinds of Bodies. An Inſtrument for meaſuring the Swiftneſs and Strength of the Wind. An Inſtrument for raiſing a continual Stream of Water, by turning round a moveable Valve within the hollow of a cloſe Cylindrical Barrel. Several kinds of Thermometers for diſcovering the Heat or Cold of the Air. An Inſtrument for planting of Corn. Divers ſorts of Hygroſcopes made with ſeveral Subſtances, for diſcovering the Dryneſs and Moiſture of the Air. Several kinds of Ways to examine the Goodneſs and Badneſs of Water. Several kinds of Otacouſticons, or Inſtruments to improve the Senſe of Hearing. Divers Models of Chariots, and other Inſtruments for progreſſive Motion. A Chariot-way-wiſer meaſuring exactly the Length of the Way of the Chariot or Coach, to which it is applied. An Inſtrument for making Screws with great diſpatch. A Way of preſerving the moſt exact Impreſſion, of any Seal, Medal, or Sculpture, and that in a Metal harder than Silver. Many more they have invented, which are omitted, becauſe theſe are ſufficient to ſhew, that there is ſcarcely any Art or Trade, how mean ſoever, but they have made ſome conſiderable Additions to it for the common Good. And now having conſidered the Improvements they have made in our Arts and Trades by Land, I ſhall proceed to our Maritime Affairs, and ſee if they have vouchſafed that hazardous Employment any Aſſiſtance, which ſhall be my next Head of Mechanical Arts.

4. Building of Ships, and the whole Art of Navigation, with the various Trade and Employments buſied about the fitting out of a Ship either

for Merchandize or War, Fiſhing or Sailing, or any other Buſineſs or Work at Sea, have all been particularly conſidered in theſe later Ages by the Learned, and by their Induſtry and Experiments much improved. Antiquity gives us an Account of Ships, and Sea-fights, Merchandizes and Piracies, as if Navagation had come to ſome Perfection in thoſe Ages, when the *Phœnicians* and *Tyrians* were great merchandizing Cities, and *Xerxes*'s Fleet maintain'd a Sea-Fight with the *Græcians*: But alas! their Ships were little better than large flat-bottom'd Boats, and their Voyages little more than creeping by the Shores from one City to another, or to ſome Iſlands adjoining. They knew nothing of the Great Sea: *Hercules*'s Pillars, now called the Straights, was with them the End of the World, and all their Sail was within the *Adriatick*, *Archipelago*, and *Mediterranean* Seas. Tis not much above a Century ſince the *Portugueze*, who firſt adventured into the Great Sea, and diſcovered many Countries in *Africa* and the *Eaſt-Indies*, yet had neither Skill nor Courage to venture into the wide Ocean, but proſecuted all their Trade by Coaſting. Ships of great Burthen, and the Mariners Compaſs, by which Sailing in the main Ocean became feaſible and ſafe, are the Invention of a late Poſterity, and have within a few Years been much improved by the Inquiries of Sagacious Men; for they have employed much Time in examining the Fabrick of Ships, and have tried what Figures of ſwimming Bodies are fitteſt for Expedition, and leaſt apt to be overturn'd, that they might make a true Theory of the Forms of Ships and Boats for all Uſes. They have inquired into the

Nature of their Sails, and other Parts of a Ship, to find in what Faſhion their Sails ought to be made moſt conveniently; the Shapes of Keels; the Sorts of Timber fitteſt to build them with, and have buſied themſelves in planting Firs for Maſts, and in bettering Pitch, and Tar, and Tackling, for which they doubtleſs deſerve, and have the Thanks of all our Merchants, Maſters of Ships, Mariners, and Sailors, who reap the Benefit of their Labours.

Beſides, the many uſeful Experiments about the Loadſtone (above-mentioned) they have invented divers other Inſtruments for the Benefit of Navigation, *viz.* Three ſeveral Quadrants made after three new Contrivances, which, tho' they are not above eighteen Inches in the Diameter, and ſo are eaſily manageable in any Place by Land or Sea, yet are far more exact than the beſt that have been hitherto uſed, either for Aſtronomical Obſervations, or taking Angles at Land. Another Inſtrument for taking Angles by Reflection, by which Means the Eye at the ſame Time ſees the two Objects, both as touching in the ſame Point, though diſtant almoſt to a Semicircle, which is of great Uſe for making exact Obſervations at Sea. A new kind of Backſtaff for taking of the Sun's Altitude by the Shadow and Horizon, which is ſo contrived, that though the Shadow be at three Foot diſtance, or as much more as is deſired, yet there ſhall not be the leaſt Penumbra, and the Shadow may be diſtinguiſhed to the fourth Part of a Minute. Several kinds of Levels for finding the true Horizon, when by one, not above a Foot long, the Horizontal Line may be found without the Error of many Seconds; all which are of great Uſe to Sailors.

Other new Inventions they have, which, though of no great Benefit in Navagation, yet may be of Advantage to Merchants and Travellers, *viz.* A new Inſtrument for fetching up any Subſtance from the Bottom of the Sea, whether Sand, Shells, Clay, Stones, Minerals, or Metals. A new Bucket for examining and fetching up whatever Water is found at the Bottom of the Sea, or at any Depth, and for bringing it up without mixing with the other Water of the Sea, through which it paſſes. Two new Ways of ſounding the Depth of the Sea without a Line, for examining the greateſt Depth of the Sea in thoſe Parts that are remote from Land; with many other Experiments both uſeful and curious.

The Pearl-Fiſhing about the Iſland of *Ceilon* in the *Eaſt-Indies*, is a late though very gainful Sea-Trade. The Manner of it is this: At a ſet time of the Year the Divers come with their Boats, bringing with them a certain Quantity of ſquare Stones in every Boat, upon which they go down into the bottom of the Sea, having given a Token to their Companions, when they think it Time to be hauled up. Each Stone pays a Tribute to the Company. Before they go down, they provide againſt the Danger, by making their Wills, and taking leave of their Friends, and then faſtning the Stones to their Feet, go down to the Bottom of the Sea naked, without any Artifice. The Oyſters or Shell-fiſh which they bring up, they do not open, but lay them on Heaps or in Holes by the Sides of the Shore. When the Diving Time is ended, the Merchants come and buy theſe Heaps, according as they can agree, not knowing whether they ſhall get any Thing or no. 'Tis very probable, this Trade might be more gainful and leſs hazardous, if it were managed with more Art (for it does not appear, that theſe Divers are any other, than ſuch as Poverty or Coveteouſneſs has made deſperate) and therefore the Learned have invented ſeveral Inſtruments to render their Diving more ſafe, and for a longer Time, *viz.* A Bell, wherein a Man may continue at a conſiderable Depth under Water, for half an Hour without the leaſt Inconvenience. An Inſtrument wherein the Diver may continue long under Water, and walk to and fro, and make uſe of his Strength and Limbs, almoſt as freely as in the Air. A new Sort of Spectacles, whereby a Diver may ſee any Thing diſtinctly under Water. A new Way of conveying the Air under Water, to any Depth for the Uſe of Divers; which Inventions, were they put in Practiſe, would doubtleſs conduce much to the Profit and Safety of theſe bold Adventurers. Thus have I given an Epitome of ſome of our Modern Improvements in Arts and Sciences, which being but a few of many, ſuch as deſire a fuller Knowledge of them, may have recourſe to our *Philoſophical Tranſactions*, ſeveral ingenious Pieces of the Learned Mr. *Boyle*, and others of the *Royal-Society*, which keeping a Correſpondence with moſt of the Learned in all Parts of the World, will fully inform the Curious and Inquiſitive, how much all Arts have been of late wonderfully improved, and brought to a Perfection far greater, than they were in former Ages. There is yet one kind more, that ought not to be omitted though it be but briefly touched on; and that is,

3. The Arts and Engines of War, which though it be to be wiſhed there never had been occaſion for, eſpecially among Chriſtians, to whoſe peaceable Profeſſion Wars are as great a Diſgrace, perhaps as Vice; yet ſince the ſame Engines and Inſtruments of War, which ſerve to carry on the Deſigns of Uſurpation, Tyranny, and Ambition, are as uſeful for the Defence of Innocency, Property and juſt Dominion, there can be no good Reaſon given, why they may not come under our Conſideration, as well as any other Things. Indeed, the Art of Fighting was ſo much practiſed and ſtudied by the Ancients, from *Nimrod* down as far as *Auguſtus Cæſar*; when to make Room for the Prince of Peace, *Swords were turned into Plow-Shares, and Spears into Pruning-Hooks*; that 'tis a Wonder, any little Stratagem, Fortification, or Weapon of War, could have eſcaped their Knowledge, eſpecially the *Greeks* and *Romans*, who were very curious in the diſcipline of War, yet in all theſe the greateſt Changes and Improvements have been made by modern Diſcoveries, as a few Inſtances may clearly evince. And,

1. As to the Weapons or Inſtruments of War, if thoſe muſt be counted the moſt excellent and uſeful, which make the greateſt Deſtruction, of Enemies, never any Thing came near the modern Invention of Guns and Gunpowder, of which we never find ſo much as the leaſt mention in Antiquity, nor can the Uſe of them be traced higher than the Battle of *Foſſa Claudia*, wherein the *Venetians* by the Help of theſe, then unknown Engines of War, obtained a notable

Victory over the *Genoeſes*, *A. D.* 1380. Divine Providence may ſeem to have given Birth to this terrible Invention, that ſuch unquiet Spirits as ſtir up Wars, may ſee the Flaſhes of his Anger flying in their Faces, and roaring in their Ears, that all Men may grow more peaceable, when they ſee their Ruin almoſt unavoidable by War, both by Sea and Land. This Device was deſtructive enough at firſt, but has been made much more ſo by the great Improvements made in preparing the Gunpowder with the beſt Materials, *viz.* Salt-petre and Brimſtone refined, and the Charcoal of Withy or Alder, and in the exacteſt Proportion, *viz.* ſix or eight Parts of Petre, and one apeice of the other two, and by the Rules of managing the Guns, made with the fineſt Art and Form, for which we have ſeveral Inſtruments or Engines: As 1. For the finding the Force of Gunpowder, by Weights, Springs, Sliding, *&c.* 2. For receiving and preſerving the Force of Gunpowder, ſo as to make it applicable for the performing any Motion deſired. 3. For the examining the Recoiling, true Carriage, and divers other Properties of Guns. 4. For trying the Swiftneſs of Bodies ſhot out of a Gun: Which Rules being obſerved in the ſeveral Sorts of Guns, as Canon, Mortars, *&c.* loaded after ſeveral Forms, have rendred them the moſt ſerviceable Engines of War, which were ever found out. Other Inventions of this kind there are, but not to be reckoned with this, and ſo ſhall be ſuperſeded to avoid tediouſneſs.

2. Nor are theſe later Ages arrived at leſs Perfection, as to Fortifications. The Ancients contented themſelves with little more than a

bare Wall about their Towns and Cities, that being ſufficient to defend them againſt the Offenſive Weapons then in Uſe; but ſince the Sieges of Towns have been managed with Canon, againſt whoſe forcible Aſſaults ſingle Walls are of little uſe, the Fortifications of Places have been mightily augmented and altered into Curtains, Baſtions, Half-Moons, Ravelins, Horn-works, Tenails, Counter-guards, Ditches, and many other Out-works, to render them as impregnable as may be, though nothing at laſt proves ſo ſtrong as to withſtand the Batteries. The Difficulty of taking them with the great Loſs of Mens Lives and expenſe of Time and Treaſure, not the Impoſſibility, are the only Diſcouragment of attacking them, and in this it is, that ſuch fortified Places muſt depend for Security.

3. As for Stratagems of War, they depend ſo much upon Time and Place, the Bravery and Ingenuity of Generals and Commanders, that we can have no better Reaſon to think ours in theſe later Ages have excelled the Ancients, than by the Difficulty of thoſe Actions, which have been always attended with Succeſs, And of this we have had ſo great an Example in a General of our own that as conſidering the Enemy, neither *Cæſar* nor *Alexander* made greater Conqueſts, ſo by the Bravery of the Attempts, and the Succeſs attending, we muſt judge that never deſigns were better laid, nor better ſeconded with Courage and Conduct, which will be his more laſting Statue, than any of Stone or Braſs.

Thus have we a ſhort Account of the Improvements made by the Moderns in moſt Arts and Sciences, and many new Inventions ſuperadded. Whether we are yet Loſers, by the want of what the Ancients enjoy'd more than we have added or found out, let the equal Reader judge. If we have Reaſon to lament the Loſs of ſome Things never to be recovered, we have Hopes, that as many Things of great Uſe have been lately invented, ſo if this inquiſitive Genius remains in the Men of this Age, as we have no Reaſon to fear but it will, we may not doubt, but in ſome few Years our Loſſes may be wholy recovered. Many Things are yet in Embryo, and daily Experiments are making almoſt in every Art. The moſt ingenious Heads are at Work to compleat every Thing, that can be ſuppoſed defective in all Things uſeful, though they are not yet brought to light, till their Benefit can be made more certain. Let the Curious and ſuch as are deſirous to know the Progreſs of ſuch Endeavours look into the *Philoſophical Tranſactions*, and other Treatiſes of the *Royal Society* in *England*, and *Royal Academy* in *Paris*, and they will find the Learned of this Age, as diligent to retrieve the Loſs, as our Anceſtors were careleſs in the Uſe of the Arts and Sciences. They are making Trials in the Fire and Flame, in the Air, and Water, Mines and Metals, Stones and Vegetables, Beaſts and Inſects, Heat and Cold, Rarity and Denſity, Preſſure and Levity, Fluidity and Firmneſs, Light and Sounds, Taſte and Smell, Colours, Motion, and all Things, that can be any Ways ſerviceable to the Good and Welfare of Man. And no Doubt, but God will ſo bleſs their Innocent and Pious Endeavours, ſo full of Charity and Goodneſs, that they ſhall not fail to produce ſuch Effects of their Diligence and Charge, as ſhall make their Memories precious to a late Poſterity, and if not wholly recover our Loſſes, yet make them inconſiderable. *Amen.*

FINIS.

AN INDEX OF THE Principal Matters Contained in *PANCIROLLUS*.

A.

ACTION in Speaking loſt Page 128
Adrian's Mole, Caſtle of St. *Angelo* 93
Agate 37, 42
Alabaſter 37, 42
Alumen plumoſum 13
Ambaſſadors, 215. violated 216

Ammoniack-Salt 34
Amomum 25
Amphitheatre 47, *&c.*
Androclius, the Story of him and the Lion 230
Apples 44
Aqua Fortis ſeparates Braſs from Gold and Silver, 308
Archimedes his Globe, 333. Suppoſed the Inventor of Guns 385
Argentarii 60
Armories or Arſenals 205
Asbeſtine 11
Aurichalcum 20
Azzalum 32

B.

Babylon, its Walls. 105
Ball-playing, Tennis, *&c.* 78
Balſamum, *Opobalſamum*, *Xylobalſamum* 29, 31
Baſilicæ 55, 56
Baths of *Antonine*, *Diocleſian*, *&c.* 89
Bdellum 29
Beds to lye on at Table 176
Bells invented 326, 327. Of Stone 328. Pagans uſed them 328, 329
Bezoar-Stone, good againſt Poiſon, *&c.* 284. Where found 288. Value 290
Bochis King of *Egypt*, his Blindeſs and Cure 98
Botargo 405
Brachygraphy 334
Braſs, uſed to write on 357
Buildings 47. Private 72
Byſſus 13

C.

Canella 22
Capitol at *Rome* 106
Carbaſus 13
Caſia lignea 22, 24. *Odorata* 26. Where it grows 293
Caviare 405
Cellars of the Ancients 83
Cedro digna locutus, explain'd 133
Ceſtus his Tomb 93
Cheeſe, how ordered by the *Romans* 61
Childrens Habits 141
Chimnies, whether the old *Romans* had any 73, *&c.* 79
China, a Root 266
Chineſe, Guns and Printing with them 385
Chriſtians thrown to wild Beaſts 225
Chymiſtry 307. Qualifications of the Teachers and Learners of it 319
Cicero and *Demoſthenes*, ſtudied Action in ſpeaking 130
Cinnamon 22
Cirque 54
Claſp of the old *Romans* 145
Cleopatra drinks diſſolved Pearl 19
Clepſydræ 240, 332
Clocks 330. Great Art ſhewn in them 331
Coloſſus at *Rodes* 106
Compitales Lares 67
Corinthian Braſs 114
Coſter, one of the firſt Printers 344
Coſtus, *Pſeudocoſtus*, *Coſtamomum* 25
Cyphers and Characters 363. Uſed by *Jul.* & *Aug. Cæſar* 364

D.

Diadems and Belts 164
Diana's Temple 105
Diſtilling, the Invention of it 322, 324
Divinity 429
Doors and Gates open'd outwardly 75, 81
Drums, their Antiquity 200
Duels 394

E.

Eagle, the *Roman* Enſign 197. And other Creatures beſides *ibid.*
Eating among the Ancients, how often, and in what Manner 175. The Poſture 176, *&c.*
Egyptians, addicted to Chymiſtry 307
Elephantini Libri, Ivory-Books 356
Emeralds 40
Encoſtum, Purple-Ink, uſed only by Emperors 7
Encauſtick Picture *ibid.*
Enoch's Pillars 356

F.

Faction, whence 58
Falernian Wine 45
Faſces 165
Flax unquenchable 11. *Cretick* 12. *Cyprian ibid.* Silken 13
Folium Barbaricum 24
Fora 62, 63
Fruits 44
Funeral Rites 233
Fuſt, John, the Inventor of Printing 345

G.

Galleys 119. The Puniſhment of being condemn'd to them 232
Games of the Ancients 226
Geography 428
Gladiators 229
Glaſs, Ductile 116. The Fate of the Inventor *ibid.*
Gold, not much uſed by the Ancients 172, 219
Made of Braſs 310. And Quick-ſilver 317
Guaiacum 266
Guns invented by a *German* 384. When firſt uſed in War 388
Guttenberg, John, one of the firſt Printers 346
Gymnaſia 88

H.

Habits and Garments of the old *Romans* 140, 145, 146, *&c.* Of *Greeks* and *Jews* 149. Of the Emperors 159
Hawking, unknown to the Ancients 401
Helena, a *Ruſſian* Queen, violates Embaſſadors 216
Hermes Triſmegiſtus his Table 315
High-ways of the *Romans* 64
Horſes, their Accoutrements 166. There Original 194, 195, 373
Hours, how meaſur'd of old 240
Houſes, how built of old 74
Husbandry 431

I.

Jaſon's Golden-Fleece, what 307
Jet 10
Jewels 37. One of a great Price 39
Images that ſpoke 334
Indian-Leaf 24. Iron 32. Figgs 266. Nuts, Canes, Stone-knives, &c. 266. Story of the Indian, and Letter 362
Infants Play-things 140
Ink, whence ſo call'd 7
Inſulæ, Houſes ſo call'd 80
Iron, its Uſe and Invention 33, 34.
Iron-Rings worn on the Finger 219
Iſthmian Games 227

L.

Labarum 199
Labyrinths 100, 102
Lacedæmonian Way of writing Secrets 363
Lacopella 309
Laſer, *Laſerpitium* 26
Latton 21. Call'd *Æs Coronarium* 308
Laurel, why uſed in Triumphs 213
Letters, Capital, uſed by the Ancients 131
Libraries, in *Italy*, *&c*. 68. in *Egypt* and *Conſtantinople* 69. At *Heidelberg* 71. That at *Conſtantinople* burnt 358
Logick 424

M.

Malobathrum 26
Malum, the Fruit ſo call'd 46

Manna,

Manna, Of the *Greeks* and *Arabians* 299. Where to be got 301. How call'd in *Latin* Authors 302. That of the *Iſraelites* 305
Marbles, ſeveral Sorts 35. Fragments 82
Marble Figure at *Ravenna* 37
Margarites 38, 39
Mariners Compaſs 335
Marriage, how ſolemnized of old 221
Mathematicks 425
Mauſoleum, built by *Artemiſia* 105
Meaſuring oil, Wine, *&c.* The old Way of it, 174
Mechanicks 430
Medicks 426
Meniana, Buildings 64
Mercury's Pillars 356
Military Cuſtoms of the Ancients 192. Muſick 200. Breaſt-Plates *ibid.* Engines 201, 383. Crowns 203
Mills, ancient and modern 398
Mimicks, mute Muſick 126, 127
Mines, who condemn'd to them 231
Moſaick Work 73, 74

N.

Navigation, ancient and modern 335
Naumachiæ at *Rome* 107
Neapolitan Diſeaſe 266, 274, *&c.*
Nemeæan Games 228
New-World 265
New-Year's Gifts 238
Nomenclators 236
Nux, what Fruits ſo call'd 46
Nymphæa 57

INDEX.

O.

Obeliſks at *Rome* and in *Egypt* 95, 96
Obſidian Stones 10
Odeum, a Muſick Room 50
Olympian Jove's Image 106
Olympick Games 227
Ovation 213
Oyl, incombuſtible 115

P.

Palaces of old made Religious Houſes 73
Palæſtræ 87
Paper of the Ancients, different ſrom ours, 118, 349. Eight Sorts mention'd by *Pliny* 360
Parchment 351, 361
Pears 44, 45
Perozes King of *Perſia*, his *Margarite* 39
Phyſicks 425.
Pickles 184
Pictures and Statues 77
Pillars of *Trajan* and *Antonine* 91
Piſtrinum, a Place of Correction 399
Porcellane, 281. Diſcovers Poiſon 283
Precious Stones 37, 112
Printing, the Invention and Improvement of it, 338, *&c.* In *China* and the *Indies* 342. Firſt printed Bible, 348. Catalogue of firſt printed Books 408, *&c.*
Purple 1. Its Original, how made, why loſt 2. Put for Magiſtracy, *ibid.* Purple Fiſh, 3. Purple Shooes, *ibid.* & 160. The Fiſh voracious

to a Proverb, 4. Purple Ink, 6
Pyramids of *Egypt*, 99
Pyrrhus, his Agate 37, 43

Q.

Quintanes, their Antiquity and Uſe 394

R.

Ragnachild, ſome Account of her 358
Rhubarb, 291. Difference between old and new 292
Rings worn on the Fingers 220
Roſcida mella in *Virgil*, Manna 301
Rubrick, whence derived 136

S.

Saddles, Stirrups, and Horſe-ſhooes invented 373
Saluting Emperors and Grandees, the Manner of it 163
Sarſaparilla 266
Saſſafras *ibid.*
Schæffer, *Peter*, one of the firſt Printers 346
Servants made free, their Habits 158
Short-hand invented by *Tyro*, 364. Or *Mecænas* 368
Silks of ſeveral Sorts 403
Silver-plate uſed by the *Romans* 170
Snow kept all the Year 180
Spagyrick Art, Chymiſtry ſo call'd 311
Spartan Virgins exerciſed naked 87

Spectacles for the Eyes, as old as *Plautus* 372
Specular Stones 15
Sphinx, an *Egyptian* Statue 104
Squaring the Circle 377
Stacte 29
Stadium 86
Standards 193
Sugar, Ancient and Modern 294, 297. Sugar-Candy *ibid.*
Sun-Dials of the Ancients 332
Supper of the Ancients, at what Time of the Day 176
Sweet-meats 182, *&c.*

T.

Taberna 56
Talus, Stories of him 358
Teſtudo, a kind of Snake 168
Theatres, of ſeveral Sorts. 47, 49
Thebes in *Egypt* 105
Theophraſtus, firſt founded a Library 68
Thunder allay'd by the ringing of Bells 328
Triumphs 206
Triumphal Arches 90
Twelve Tables at *Rome* were Braſs 357
Tyrius color, Purple; why ſo call'd 3
Tyro, Inventor of Short-hand 364

V.

Velvet 403
Venice, the famous Arſenal there 205
Vio-curi, dii vii, viales, dea vibilia 66, 377

W.

Wallis, Dr. decypher'd Letters in the Civil Wars 366
Wild-Fire, the Feats done with it 390
Wine, how made of old 84
Writing, the way of the Ancients in it, 132.
And how they made up the Paper 132, 136

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